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GEOLOGIC MAP OF THE SOUTHWEST PART OF THE SAN FRANCISCO VOLCANIC FIELD, NORTH-CENTRAL ARIZONA

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INTRODUCTION

The geologic map of the southwest part of the San Francisco volcanic field (called the Southwest map area) is one of five adjoining geologic maps (fig. 1) prepared under the Geothermal Research Program of the U.S. Geological Survey as a basis for interpreting the history of magmatic activity in the volcanic field. The San Francisco field, which is largely Pliocene and Pleistocene in age, is in northern Arizona, just north of the broad transition zone between the Colorado Plateau and the Basin and Range province. It is one of several dominantly basaltic volcanic fields of late Cenozoic age situated near the southern margin of the Colorado Plateau. The Southwest map area encompasses approximately 1,130 km^2.

The volcanic field contains rocks ranging in composition from basalt to rhyolite--the products of eruption through Precambrian basement rocks and approximately a kilometer of overlying, nearly horizontal, Paleozoic and Mesozoic sedimentary rocks. About 500 km^3 of erupted rocks cover about 5,000 km^2 of predominantly Permian and locally preserved Triassic sedimentary rocks that form the erosionally stripped surface of the Colorado Plateau in northern Arizona.

In the Southwest map area, basalt and basaltic andesite and lesser amounts of andesite, benmoreite, and dacite were extruded from numerous individual vents, each of which presumably erupted briefly and then became inactive. Such short-lived vents, mostly represented by cinder cones, are widely distributed over the map area, and their flows cover much of its surface. However, eruptions over extended periods formed the larger edifices of Bill Williams and Sitgreaves Mountains. Bill Williams Mountain is predominantly a cluster of dacite domes and flows with flanking andesite and benmoreite flows. Sitgreaves Mountain consists predominantly of clustered rhyolite domes and flows.

A northeastward progression of volcanism during the past 15 m.y., from central Arizona into the San Francisco volcanic field, is shown by the compilation of Luedke and Smith (1978). Although complicated in detail, a general northeastward to eastward progression of volcanic activity is also apparent within the San Francisco volcanic field. In the Southwest map area, the map data suggest that a general northeastward migration of volcanism occurred between approximately 6 and 1 Ma.

The Mesa Butte fault is a major structural feature trending northeast across the southwest quadrant of the Southwest map area. A second prominent fault, the LO Draw fault, strikes north-south and lies north of Bill Williams Mountain. Both the Mesa Butte and the LO Draw faults are partly buried by volcanic rocks younger than the latest faulting. Interpretation of similar structures exposed in the Grand Canyon indicates that such faults probably originated during Precambrian time and have been subsequently reactivated (Shoemaker and others, 1978). Late Cenozoic faulting continued until at least about 0.4 Ma within the volcanic field, but deformation of the flows and cones has been minimal.

MAPPING AND MAP CONVENTIONS

Boundaries of all rock units, including individually mapped lava flows and vent deposits, were traced in the field. Strict attention was paid to details of lithology as well as morphology in delimiting the units.

The geologic map (Map A) departs from conventional U.S. Geological Survey format in several ways in order to portray the extensive stratigraphic, chronologic, and lithologic information in a more readable manner. Individually mapped basalt and basaltic andesite flows, vents, and intrusive rocks (the products of brief local eruptions and intrusions) have been grouped into map units delimited on the bases of magnetic polarity, radiometric age, and field relationships. These map units are chronostratigraphic or polarity-chronostratigraphic units as defined by the North American Commission on Stratigraphic Nomenclature (1983). Within these chronostratigraphic units, boundaries are shown between adjacent flows because their individual lithologic characteristics and stratigraphic

relationships are important in interpreting the magmatic history of the individual vents and of the field as a whole. Except for these chronologically grouped flows, vent deposits, and intrusive rocks, the map units are lithostratigraphic units.

Map B shows the basalt types, the magnetic-polarity designations and sample localities, and the localities for all analyzed rock samples listed in tables 1-5.

The "Correlation of Map Units" is constructed using an absolute time scale for the volcanic units that combines the radiometric and paleomagnetic age data with the stratigraphic relations. The extrusive and intrusive rocks exclusive of the two major eruptive centers are portrayed together in the left-hand part of the correlation diagram. These basalt and basaltic andesite units, along with the scattered, isolated units of andesite, benmoreite, and dacite, are described together in general order of increasing age. Extrusive and intrusive rock units of the two major eruptive centers, including outlying but related andesite, dacite, and rhyolite domes, flows, and pyroclastic deposits, are grouped by eruptive center and shown in the right-hand part of the correlation diagram. The descriptions of these map units in the "Description of Map Units" are also grouped by eruptive center.

Identification numbers assigned to vents (Map A), to analyzed samples (Map B and tables 1-5), and to paleomagnetic sampling localities (Map B) are based on the locations of vents and sample localities within the township and range system. The numbers consist of four digits that uniquely identify the section in which the sample or vent is located. If more than one sample or vent occurs within the section, the letters A, B, C, and so on are added as a suffix. The first digit of a sample or vent number designates the township by its second integer (that is, a sample or vent in Township 24 would have "4" as its first digit). The second digit designates the range. The third and fourth digits represent the section, ranging from 01 to 36. Thus a vent or analyzed sample in T. 24 N., R. 2 E., sec. 6, would have an identification number of 4206. If two or more vents or samples occur in that same section, the second one in both cases is designated 4206A, the third 4206B, and so on. West of the Gila and Salt River meridian, R. 1 W. is denoted by the letter "Z" in vent and sample numbers.

AGE AND MAGNETIC-POLARITY DETERMINATIONS

The assignment of an age to an individual volcanic unit is commonly difficult in the San Francisco volcanic field because many of the flows are largely undissected, and their bases are not exposed. In addition, for all but the youngest flows, surface detail has been largely obliterated by weathering and by a mantle of pyroclastic, eolian, and alluvial debris. Consequently, the interpretation of relative ages between adjacent flows is often equivocal. Age assignments, therefore, have been based on a combination of stratigraphic relationships that range from definitive to interpretive, magnetic polarities, and K-Ar age determinations.

K-Ar ages were determined by P. E. Damon and associates (Laboratory of Isotope Geochemistry, University of Arizona) and E. H. McKee. Some of the ages shown on Map A were originally reported by Damon and others (1974). All ages have been corrected for the revised decay constants recommended by Steiger and Jäger (1977). In a few instances, a K-Ar age is inconsistent, within the range of one standard deviation, with accepted ages for other units in an established stratigraphic sequence; the inconsistent age is not shown on the geologic map.

Magnetic polarity was determined from core samples collected and analyzed by K. L. Tanaka and others (written commun., 1979). Cores were obtained from flows and from oxidized agglutinate on the cinder cones. In a few cases, the magnetic polarity of a unit, as compared with the geomagnetic polarity time scale of Mankinen and Dalrymple (1979), is inconsistent with the radiometric age, plus or minus one standard deviation, for the same unit. Comparable inconsistencies are found in a few of the ages cited by Mankinen and Dalrymple (1979). The reason for such apparent contradictions is uncertain, and we have, in these situations, taken the K-Ar age as the correct age unless other factors argue against that conclusion.

CLASSIFICATION OF BASALTS

The basalts of the San Francisco volcanic field have been divided according to a semiquantitative scheme, utilizing thin sections, hand specimens, and outcrop characteristics, into eleven petrographic types, all of which occur in the Southwest map area. The classification is based on mineralogy and abundance of phenocrysts (1 mm or more in maximum diameter) and, in part, on the dominant mineralogy of the groundmass. Porphyritic basalts have generally one or more volume percent phenocrysts. Those classed as slightly porphyritic have generally less than one volume percent phenocrysts. Aphyric basalts contain essentially no phenocrysts. The basalt types of the San Francisco field are chemically intergradational and include basanitoid, picritic basalt, alkali-olivine basalt, hawaiite, and rare mugearite.

In some instances, a single eruption produced more than one basalt type or produced both basalt and basaltic andesite. Normally in these cases, the multiple types are intergradational within a single flow and were not mapped separately. However, in a few cases,

as for example in the flow from vent 4430 (QTab and QTb), distinct petrographic boundaries were recognized in the field and were mapped within a single flow. We have attempted to document the lithologic variety of the basalts by using symbols on Map B for each basaltic map unit (multiple letters indicate composite units) and by showing locations of chemically analyzed samples; the analyses are listed in tables 1-5.

BASALT TYPES OF THE SOUTHWEST MAP AREA

Picritic basalt (type a)--Basalt containing 12-22 percent subhedral to euhedral olivine phenocrysts. Clinopyroxene phenocrysts are common. Picritic basalt generally has a microcrystalline to intersertal groundmass of clinopyroxene, olivine, plagioclase, opaque oxides, and glass. Where associated with clinopyroxene-rich basalt (type j), the picritic basalt has a mafic, pyroxene-rich groundmass. The group includes the most magnesian basalts of the San Francisco field. The average MgO content is 13.5 percent, and the average normative-olivine content is 24.3 percent.

Clinopyroxene-olivine-phyric basalt (type b)--Basalt containing about 1-35 percent phenocrysts of clinopyroxene and olivine. Pyroxene abundance is greater than or equal to olivine abundance. Plagioclase phenocrysts are normally absent or sparse, but a few basalts in this group contain common plagioclase phenocrysts. Groundmass is generally microcrystalline to intersertal in texture and contains plagioclase, clinopyroxene, olivine, opaque oxides, and glass. The clinopyroxene-olivine-phyric basalt is predominantly of alkali-olivine basalt composition.

Clinopyroxene-phyric basalt (type c)--Basalt containing about 1-20 percent clinopyroxene phenocrysts. Scattered olivine phenocrysts occur in some units. Plagioclase phenocrysts are normally rare or absent. Groundmass is microcrystalline, intersertal, or intergranular in texture and contains plagioclase, clinopyroxene, olivine, opaque oxides, and glass. Basalt with clinopyroxene phenocrysts is not included in this group when it has the distinctive granular, clinopyroxene-rich groundmass that distinguishes the clinopyroxene-rich basalt (type j). The clinopyroxene-phyric basalt is predominantly of alkali-olivine basalt composition.

Olivine-phyric basalt (type d)--Basalt containing about 1-12 percent subhedral to euhedral olivine phenocrysts. Scattered clinopyroxene phenocrysts are common. Plagioclase phenocrysts are normally rare although they are common in some olivine-phyric basalts. Groundmass contains variable amounts of plagioclase, clinopyroxene, olivine, opaque oxides, and glass; textures include microcrystalline, intersertal, intergranular, and subophitic. The olivine-phyric basalt is predominantly of alkali-olivine basalt composition.

Plagioclase-phyric basalt (type e)--Basalt containing about 1-25 percent plagioclase phenocrysts; groundmass and phenocryst plagioclase are commonly seriate. Scattered olivine and clinopyroxene phenocrysts may be present. Groundmass consists mostly of intersertal to intergranular aggregates of plagioclase, clinopyroxene, olivine, opaque oxides, and glass; plagioclase is commonly dominant. Range of compositions of the plagioclase-phyric basalt is similar to that of the aphyric (type h) basalt. The plagioclase-phyric basalt is predominantly of hawaiite composition.

Quartz basalt (type f)--Basalt containing ubiquitous (generally about 0.5 percent) quartz. Many basalts contain rare, commonly polycrystalline quartz grains, but those basalts are not included in this group. In quartz basalt, the quartz occurs as single crystals that range from spherical, rounded (detrital?) grains to irregular, angular fragments to nearly euhedral crystals. The quartz typically has a reaction rim composed of very fine grained clinopyroxene. Plagioclase phenocrysts are commonly intensely corroded or sieved. Otherwise the quartz basalt is similar to other basalt types and probably represents a contaminated counterpart of them. Quartz basalt is slightly enriched in SiO_2; normative quartz averages 0.5 percent and ranges to as much 3.3 percent.

Microporphyritic olivine basalt (type g)--Basalt containing about 1-10 percent olivine microphenocrysts (less than or equal to 1 mm) in an intersertal to intergranular groundmass of plagioclase, clinopyroxene, olivine, opaque oxides, and glass. The composition coincides in part with the compositions of the mafic porphyritic basalt types (b, c, d); however, those types have slightly higher average values of CaO or MgO or both than does the microporphyritic olivine basalt. The microporphyritic olivine basalt is predominantly of alkali-olivine basalt composition.

Aphyric basalt (type h)--Intersertal to subophitic basalt composed of plagioclase, clinopyroxene, olivine, and opaque oxides, with or without glass; plagioclase is commonly dominant. Some of the most plagioclase-rich are trachytic in texture. Compositional range is nearly identical to that of the plagioclase-phyric basalt (type e). The aphyric basalt is predominantly of hawaiite composition.

Slightly porphyritic basalt (type i)--Basalt containing less than 1 percent phenocrysts of olivine, clinopyroxene, and (or) plagioclase in an intersertal to intergranular groundmass of plagioclase, clinopyroxene, olivine, and opaque oxides, with or without glass. Slightly porphyritic basalt includes both alkali-olivine basalt and hawaiite compositions.

Clinopyroxene-rich basalt (type j)--Basalt distinguished by a granular clinopyroxene-rich

groundmass in which clinopyroxene greatly exceeds plagioclase in volume, opaque oxides and olivine are subordinate, and glass is minor. Texture ranges from aphyric to porphyritic; most of the clinopyroxene-rich basalts contain phenocrysts or microphenocrysts of clinopyroxene and olivine. Pyroxene phenocrysts are commonly green and arranged in distinctive crude rosette-like clusters. Clinopyroxene-rich basalts are low in Al_2O_3 (average is approximately 14.5 percent), and include the most SiO_2-poor (average approximately 46.4 percent) and the most CaO-rich (average approximately 12.8 percent) basalts in the San Francisco field. Many of these basalts are basanitoids. Average normative nepheline content is 5.5 percent; maximum value is 12.3 percent.

Contaminated basalt (type k)--Porphyritic basalt characterized by abundant inclusions of non-basaltic composition, particularly silicic to intermediate rocks. Xenocrysts of sieved plagioclase, quartz, and hornblende are interpreted as relicts from partial anatexis. Normal basaltic phenocrysts and microphenocrysts of clinopyroxene, plagioclase, and olivine are scattered through the dark glassy groundmass. This type occurs only beneath the south base of the dacite flow (Twdf) that forms High School Hill. Its composition, given by analysis 2234, is intermediate between average values for plagioclase-rich basalts (types e and h) and basaltic andesite.

DESCRIPTION OF MAP UNITS

[Basalt types described in "Basalt Types" section. K-Ar ages have been corrected for the revised decay constants recommended by Steiger and Jäger (1977). Ma, mega-annum (10^6 years). Compositional analyses are given in tables 1-5]

SURFICIAL DEPOSITS OF QUATERNARY AGE

Qal ALLUVIAL AND COLLUVIAL DEPOSITS (HOLOCENE AND PLEISTOCENE)--Clay, silt, sand, and gravel. Mostly 1- to 5-m-thick deposits in drainages and in low-lying topographic basins; much thicker and partly dissected fan deposits occur on lower slopes of Bill Williams and Sitgreaves Mountains. Rare excavations show that some smooth-surfaced deposits mapped as alluvium include buried deposits of airfall ash and lapilli

Ql LANDSLIDE DEPOSITS (PLEISTOCENE)--Slumped debris from basalt flows on northeast wall of Big Spring Canyon

EXTRUSIVE AND INTRUSIVE ROCKS OF QUATERNARY AND TERTIARY AGE EXCLUSIVE OF MAJOR ERUPTIVE CENTERS

BASALT OF YOUNGER PLEISTOCENE (OLDER BRUNHES) AGE

Qbb Basalt flow--Flow lobe at east boundary of map area. Thickness is about 10 m. Lithology is microporphyritic olivine basalt (type g), locally aphyric (type h). K-Ar age 0.34±0.21 Ma. Polarity normal. Source, vent 3521, is 21 km northeast of map area

BASALT OF PLEISTOCENE (OLDER BRUNHES OR MATUYAMA) AGE

Qbmb Basalt flows and cinder cones--Flows, medium- to dark-gray, yellowish- to dark-brown where weathered. Thickness is from <10 m to approximately 50 m. Flows are in northeastern part of map area, near eastern edge. Cones (vents 4302A and 4408) are rounded, undissected. Lithologic variety includes porphyritic, microporphyritic, and aphyric basalt types (b,g,h,i). Polarity normal

BASALT OF PLEISTOCENE (MATUYAMA) AGE

Qmb Basalt flows and cinder cones--Flows, medium- to dark-gray, yellowish- to dark-brown where weathered, <10 m to approximately 40 m thick, undissected except for vent 3430 flow, which was emplaced on steep western slope of Sitgreaves Mountain. Cones, rounded, somewhat subdued, undissected to superficially gullied (except for cone of vent 3430, which may be a small erosional remnant of a once larger cone); consist of bedded cinders, agglutinated spatter, bombs; color is mostly dark gray to red where fresh, yellow brown where weathered. Unit includes porphyritic, microporphyritic, and aphyric basalt types (d,g,h,i) and quartz basalt type (f). K-

Ar ages for flows from vent 3335 (Frenchy Hill) and vent 2420 are 1.07±0.06 and 1.41±0.13 Ma, respectively. Polarity reversed

EXTRUSIVE AND INTRUSIVE ROCKS OF PLEISTOCENE OR LATEST PLIOCENE (MATUYAMA) AGE

QTmb Basalt flows and cinder cones--Flows, medium- to dark-gray, yellowish- to dark-brown where weathered, <10 m to approximately 50 m thick. Cones, mostly rounded, with smooth to partly gullied slopes, consist of cinders, agglutinated spatter, and bombs; color is dark gray to red, yellowish brown where weathered. Unit includes porphyritic, quartz-bearing, microporphyritic, and aphyric basalt types (b,d,e,f,g,h,i). Cinder cone at vent 3226 contains abundant ultramafic xenoliths and small numbers of gabbroic, granitic, metamorphic, and sedimentary xenoliths. K-Ar age of flow from vent 1229 is 2.08±0.48 Ma. Polarity mostly reversed

QTmbt Basaltic tuff of vent 3229--Gray and yellow-brown tuff. Moderately well bedded; beds include sandwave and planar beds. Tuff consists of glassy vesicular basalt fragments (≤5 mm) and crystals of pyroxene and olivine (≤1 mm) in a matrix of basaltic glass and quartz sand. Unit was probably formed by an early phreatomagmatic eruption of vent 3229

QTmbp Basalt pyroclastic sheet--Airfall deposit of basaltic cinders and ash derived from an unknown source near Squaw Mountain. Unit is surrounded by alluvial deposits

QTmbi Composite basalt dike of Little Squaw Mountain--Dike intruding basaltic cinder cone of vent 3407. Dike is 1-2 m wide, 500 m long, consists of olivine-phyric basalt (type d) in interior (analysis 3407A) and plagioclase-phyric basalt (type e) at margins (analysis 3407). Dike encloses a tabular 5- x 70-cm inclusion of partly melted meta-sandstone

QTmab Basaltic andesite flows and cinder cones--Flows, cinders, and spatter from four vents (4301, 4417, 4418A, and 4418B) near northeastern corner of map area. Flows, dark-gray, yellow-brown to brown where weathered, blocky in part, <10 m to approximately 60 m thick. Vent deposits form smooth to strongly gullied cones of cinder and spatter. Unit is porphyritic. Phenocrysts and microphenocrysts of clinopyroxene and plagioclase are ubiquitous, phenocrysts of hornblende, olivine, and hypersthene occur locally, and rounded quartz with reaction rims of clinopyroxene is common. Plagioclase is typically intensely corroded, sieved, and embayed by the groundmass. The groundmass is mostly fine grained and glassy, ranging from hyalocrystalline to intersertal; it normally contains felty plagioclase microlites, magnetite, and small crystals of clinopyroxene or hypersthene or both. Unit is among the most CaO- and MgO-rich and Na_2O-poor of the andesitic rocks.

Vent 4301 apparently erupted both basalt and basaltic andesite, and local unmapped segregations of basalt occur within the basaltic andesite. This particular basaltic andesite is characterized by the additional occurrence of abundant microphenocrysts of clinopyroxene arranged in clusters ≤1 mm across and by the presence of small fine-grained inclusions containing acicular clinopyroxene, opaque minerals, and some plagioclase in a glassy groundmass (for composition see analysis 5336A, Northwest map).

Polarity reversed

QTmai Basaltic andesite dike of Buck Mountain--Vertical dike, about 20 m wide, intrudes basaltic andesite cinder and spatter cone at Buck Mountain (QTmab, vent 4301), forming a 300-m-long ridge on south flank of cone. Dike contains abundant phenocrysts and microphenocrysts of clinopyroxene as euhedral grains and in rosette-like clusters 1-2 mm in diameter and scattered phenocrysts or xenocrysts (≤2 mm) of corroded plagioclase and

quartz, which commonly has a reaction rim of clinopyroxene. Groundmass consists of brown glass enclosing microlitic plagioclase, clinopyroxene, opaque oxide, and sparse olivine. Small fine-grained inclusions containing clinopyroxene and opaque minerals are characteristic (for composition see analysis 5336A, Northwest map)

QTmbn Benmoreite flow and vent deposits of Horse Hill--Broadly lobate flow, light-gray to black, pale- to grayish-orange where weathered, 30-60 m thick, partly dissected. Low (50 m high) cone (vent 1407) is near center of flow. Benmoreite is slightly porphyritic; contains scattered phenocrysts of plagioclase and microphenocrysts of magnetite and light-brown pleochroic apatite in a holocrystalline groundmass of plagioclase, opaque oxide, and clinopyroxene(?). For composition see analysis 1301A.

Flow is heterogeneous; it grades locally to more mafic hornblende-olivine andesite (analyses 1418, 1419) and to dacite (analysis 1312).

Unit is overlain by basalt flow of vent 2420 (Qmb), which has a K-Ar age of 1.41 ±0.13 Ma. Polarity reversed

QTmba Basalt and andesite flow of vent 1419--Small flow approximately 800 m long, 10-15 m thick. Consists of plagioclase-phyric basalt (type e) near vent, grades to porphyritic andesite at terminus of flow, where it contains abundant phenocrysts of partly sieved plagioclase, altered amphibole, and rare olivine and clinopyroxene in a groundmass of plagioclase, clinopyroxene, olivine, and magnetite. For compositions see analyses 1419C (basalt) and 1419B (andesite).

Vent 1419 cinder cone consists of olivine-phyric basalt (type d) (analysis 1419A) as well as basalt like that of the flow. Cone has reversed polarity and is intepreted as older than the benmoreite of Horse Hill (QTmbn)

QTma Andesite of vent 4418--Cinder cone, 200-400 m in diameter, on east side of Scarp Hill. Vent deposits consist of nearly aphyric andesite containing rare plagioclase phenocrysts in a trachytic plagioclase-rich groundmass that includes interstitial glass, opaque oxide, and minor clinopyroxene and olivine. Lithology resembles benmoreite (QTmbn), but andesite has higher MgO and CaO and distinctly lower Na_2O and P_2O_5. For composition see analysis 4418. Polarity reversed

EXTRUSIVE ROCKS OF PLEISTOCENE OR PLIOCENE (MATUYAMA OR OLDER) AGE

QTb Basalt flows and cinder cones--Flows, medium- to dark-gray, yellow- brown to brown where weathered, 10 m to approximately 50 m thick, partly dissected. Cones, composed of cinders and spatter, are dark gray to red where fresh, yellow brown, brown, reddish brown where weathered; flanks are partly to extensively gullied. Unit includes microporphyritic, aphyric, and slightly porphyritic basalt types (g,h,i). Polarity normal and reversed

QTsb Basalt dome of Squaw Mountain--Dome (vent 4430) of extrusive, slightly porphyritic basalt (type i). For composition see analysis 4430. Polarity normal.

Northwest flank exposes a northwestward-dipping block composed of Kaibab Formation (Pk) and Toroweap Formation and Coconino Sandstone (Ptc). These sedimentary rocks have been uplifted approximately 300 m with respect to nearby rocks of the same formations and are overlain by the basalt, which may have been tilted outward as the sedimentary rocks were uplifted. Thus the dome may be at least partly of tectonic origin. Adjacent basaltic andesite flow (QTab) was extruded from the south flank of the dome; the uplift may have been related to its extrusion

QTab Basaltic andesite flow and cinder cone--Flow on south flank of Squaw Mountain (vent 4430) and cinders and spatter of vent 1315 south of McDougal Flat. Phenocrysts and microphenocrysts

of clinopyroxene and plagioclase are ubiquitous, phenocrysts of hornblende, olivine, and hypersthene occur locally, and rounded quartz grains with reaction rims of clinopyroxene are common. Plagioclase is typically intensely corroded, sieved, and embayed by the groundmass, which is fine grained and glassy. Flow at Squaw Mountain also contains abundant clusters (≤1 mm) of clinopyroxene. For composition see analyses 1315 and 4431. Polarity, vent 1315, reversed.

Flow of vent 4430 was extruded from the south flank of the basalt dome of Squaw Mountain (QTsb). Near its southwestern terminus the flow encloses segregations of basalt (QTb) of the same type (type i) that composes the basalt dome, suggesting that the contrasting magmas of the dome and the flow may have coexisted during eruption

Basalt, andesite, and dacite of Davenport Hill

QTdba — Basalt and andesite flow--Flow, predominantly basalt, grades to andesite, 3-25 m thick, margins mostly buried by alluvium, extruded from south flank of Davenport Hill just below the base of andesite cone of vent 1305 (QTda). Basalt is aphyric (type h). Andesite contains microphenocrysts of hornblende, olivine, and opaque oxide in a matrix of trachytically aligned plagioclase and brown glass. For compositions see analyses 1317, 1320, 2332B. Polarity reversed

QTda — Andesite cone of vent 1305--Spatter, dark-red, fine-grained, vesicular, capping the dacite dome of Davenport Hill (QTdd). Andesite is mostly aphyric, but locally contains 2- to 3-mm-long phenocrysts of altered hornblende and corroded and sieved plagioclase. Groundmass is hyalopilitic; abundant trachytically aligned plagioclase microlites and lesser amounts of opaque oxide and olivine are set in a matrix of brown glass. Inclusions of the dacite dome of Davenport Hill (QTdd), basalt, and sedimentary rocks occur locally. For composition see analysis 1305A. Polarity reversed

QTdd — Dacite dome--Dome, about 1.6 km in diameter, 150 m high, gullied. Dacite is dense, light brown to medium dark gray, aphanitic, contains sparse plagioclase laths (≤3 mm long) and altered biotite grains (<1 mm). Groundmass consists mainly of alkali feldspar and plagioclase microlites, opaque oxide (as granules and replacing biotite), and brown and gray glass with hypocrystalline to hyalocrystalline texture. For composition see analysis 1305. Polarity normal

ANDESITE OF LATEST PLIOCENE (MATUYAMA) AGE

Tmha — Andesite flow of Howard Mesa--Flow, approximately 90-130 m thick, forms flat-topped, nearly circular hill about 5 km in diameter. Flow margins are dissected. Vent area may underlie high point on flow near east margin. Andesite is dark gray to grayish black, contains scattered phenocrysts of plagioclase and quartz 1-3 mm in diameter. Plagioclase is intensely corroded and sieved; quartz, which is less abundant, is corroded and has pyroxene reaction rims. Groundmass is hyalocrystalline, consists of glass, plagioclase microlites, hornblende prisms (≤0.4 mm long) altered to opaque oxide, and other opaque grains. For composition see analysis 4213. K-Ar age 2.06±0.18 Ma. Polarity reversed

BASALT OF PLIOCENE (GAUSS OR GILBERT) AGE

Tyb — Basalt flows and cinder cones--Flows, medium- to dark-gray, yellow- to dark-brown where weathered, <10 m to approximately 50 m thick, partly dissected. Unit includes undivided flows in Pomeroy Tanks and Big Spring Canyon areas. Cones, composed of cinders and spatter, dark-gray to red where fresh and yellow-brown, brown, or reddish-brown where weathered; flanks partly to extensively gullied. Unit includes porphyritic, microporhyritic, aphyric, clinopyroxene-rich, and contaminated basalt types (b,d,e,g,h,i,j,k). K-Ar ages for flow from vent 1211 and for a flow southwest of Bill Williams Mountain are

2.84±0.25 and 4.82±0.61 Ma, respectively. Polarity normal and reversed

Tybp — Pyroclastic sheet of Cedar Mountain--Airfall deposit of basaltic cinders and ash derived from eruption of vent 3307 (Cedar Mountain). Unit mapped only where it obscures underlying deposits

Tybff — Fissure-fed flows--One or more basalt flows erupted from a fissure vent east of map area. Unit includes clinopyroxene-rich (type j) and picritic (type a) basalts; rosettes of green clinopyroxene are common. K-Ar ages for samples from Volunteer Canyon east of map area are 4.04±0.10 Ma and 4.18±0.17 Ma

Tybt — Basaltic tuff--Basaltic tuff, yellowish-gray, bedded; composed of ash, lapilli, fragments of clinopyroxene, olivine, and plagioclase, clasts of Paleozoic chert and limestone, and abundant angular quartz fragments of silt to fine-sand size; matrix at least in part calcareous. Unit also includes local deposits of unconsolidated ash and cinder. Thickness 40-60 m. Unit occurs in Big Spring Canyon, where it is buried under several younger basalt flows (QTmb, Tyb, Tybff) and overlies older flows (Tob). It forms a widespread blanket of tuff that pinches out in Sycamore Canyon about 6 km southeast of map area

Tybi — Dikes and pluton--Feeder dikes for basaltic cinder cones at vents 1233 (Coleman Knoll), 3307, and 4236 (all Tyb), and a small basalt pluton in the floor and lower walls of Big Spring Canyon.

Dikes are nearly vertical, strike northeast and northwest, and are 1-5 m wide and 50-250 m long. For composition of aphyric basalt (type h) dike of vent 3307 see analysis 3307, for picritic basalt (type a) dikes of Coleman Knoll see analysis 1234A. K-Ar age for dike at Coleman Knoll 4.17±0.39 Ma. Polarity of same dike reversed.

Pluton, 150 m wide, 850 m long, consists of slightly porphyritic basalt (type i). Intrusive contact cuts steeply across horizontally layered Kaibab Formation and basalt of Miocene age (Tob); where overlain by basaltic tuff (Tybt), the pluton has vertical columnar jointing and resembles a lava flow. On the north canyon wall, the basalt interfingers eastward with cinders mapped with the basaltic tuff. Hence the pluton is interpreted as a local feeder for the tuff unit

EXTRUSIVE AND INTRUSIVE ROCKS OF PLIOCENE OR MIOCENE AGE

Tb — Basalt flows and cinder cones--Flows, medium- to dark-gray, yellow-brown to brown where weathered, partly dissected, <10 m to approximately 50 m thick. Cones, composed of cinder and spatter, dark-gray to red where fresh, yellow-brown, brown, reddish-brown where weathered, flanks slightly to deeply gullied. Unit includes all basalt varieties (types a-j) except for type k. Polarity normal or reversed

Tbu — Basalt flows, undivided--Flows at west edge of map area, exposed largely in canyon walls, not individually mapped

Tbp — Basalt pyroclastic sheet deposit--Airfall deposit of basaltic cinders and ash in west-central part of map area, exposed mainly in excavations along Santa Fe railroad, generally well bedded, partly indurated, 2-10 m thick, locally interlayered with basalt flows (Tb)

Tbt — Basaltic tuff--Lapilli tuff, yellow, brown, or gray, indurated, well-stratified. Tuff usually consists of glassy basaltic lapilli and scattered fragments of underlying rock units such as the Kaibab Formation (Pk) or various local volcanic rocks in a fine-grained tuffaceous matrix that may contain dispersed quartz silt or sand. Unit occurs near Bill Williams Mountain, where it includes vent deposits of vents 1216 and 1218, and in scattered local outcrops in western part of map area northwest of Bill Williams Mountain.

Tuff of vent 1216, at Benham Ranch, contains basaltic lapilli, rounded detrital quartz grains, locally abundant clasts of juvenile clinopyroxene-olivine-phyric basalt (type b), and xenoliths of ultramafic and granulite composition. For composition of clasts and xenoliths see analyses 1215 B through G.

Tuff of vent 1218, within the Bill Williams Mountain center, is >130 m thick, consists of basaltic lapilli, and contains bombs, blocks, and, in the lower part, interbedded flows of microporphyritic basalt (type g); additional clasts of basaltic andesite and local dacite occur in the upper part (Pugmire, 1976). Unit is overlain by dacites of Bill Williams Mountain (Twd, Twdd). For compositions of clasts see analyses 1218F (basalt), 1218C (basaltic andesite), 1218E (dacite).

A thin tuff bed occurs below a dacite dome (Twdd) on southeast flank of Bill Williams Mountain. It contains basaltic lapilli and xenoliths of rhyolite and dacite vitrophyre, andesite, basalt, and sparse ultramafic rocks. For composition of a pyroxenite xenolith see analysis 1221A

Tbi Basalt dikes--Dikes intruding basaltic cinder and spatter cones (Tb). Dikes are vertical to steeply dipping, 1-30 m wide, and 10-500 m long. They are variable in strike, but locally, as at vent 2124 in the Three Sisters area, they are radially distributed within the host cone. Dikes include porphyritic, quartz-bearing, aphyric, and clinopyroxene-rich basalt types (b,f,h,i,j). Some dikes contain more than one basalt type

Tab Basaltic andesite flows and cinder cone--Flows and subdued elongate cinder cone (vent 2218) about 5 km northwest of Williams. Basaltic andesite contains abundant phenocrysts or xenocrysts of corroded and sieved plagioclase $\leq$4 mm long, less abundant xenocrysts of corroded quartz, scattered phenocrysts and glomerocrysts of clinopyroxene $\leq$2 mm in diameter, and sparse phenocrysts of olivine 1-2 mm in diameter, with rims altered to iddingsite. Groundmass is intersertal to hyalopilitic, contains plagioclase microlites in a matrix of clinopyroxene or olivine, opaque oxide, and brown glass. For composition see analyses 2217A, 2218. Polarity normal and reversed

EXTRUSIVE AND INTRUSIVE ROCKS OF MIOCENE AGE

Tob Basalt flows and vent deposits--Partly dissected flows and vent deposits exposed near southern edge of map area. Vent 1222, adjacent to southeast flank of Bill Williams Mountain, is an elongate, northwest-trending ridge formed principally of spatter and rootless flows that may have been erupted from an elongate fissure vent; it predates the exposed volcanic rocks of Bill Williams Mountain. Other vents (1110 and 2136) are subdued, low cinder cones. Unit includes porphyritic, microporphyritic, and clinopyroxene-rich basalt types (b,d,e,g,i,j). K-Ar age of flow from vent 1222 is 6.38$\pm$0.22 Ma. Polarity normal and reversed

Toab Basaltic andesite flows and cinder cones--Weathered and partly dissected flows and vent deposits northwest and south of Bill Williams Mountain. Basaltic andesite contains abundant phenocrysts or xenocrysts ($\leq$5 mm long) of intensely corroded and sieved plagioclase, scattered phenocrysts and glomerocrysts ($\leq$3 mm in diameter) of clinopyroxene, widely scattered phenocrysts ($\leq$2 mm in diameter) of olivine, hypersthene, and hornblende, and xenocrysts ($\leq$2 mm in diameter) of quartz, all set in a fine-grained groundmass of plagioclase, pyroxene, olivine, hornblende, opaque oxide, and brown glass. For composition see analyses 1110A, 1232, 2135, 2136A. K-Ar age for flow from vent 2135 (Signal Hill) 6.10$\pm$0.15 Ma. Polarity normal and reversed

Thcd Dacite dome of Hell Canyon--Dome, about 700 m in diameter and 110 m high, composed of light-gray dacite that forcibly

intruded adjacent basalt flows (Tob), located in Hell Canyon, 3.5 km south of Bill Williams Mountain. Dacite contains scattered phenocrysts (≤4 mm long) of tabular sodic plagioclase and microphenocrysts of hypersthene and completely altered biotite or hornblende in a pilotaxitic groundmass composed mainly of fine-grained feldspar. Composition (analysis 1231A) is significantly higher in Na_2O, K_2O, and MnO and lower in MgO, CaO, and TiO_2 than dacites of Bill Williams Mountain (Twd, Twdd, Twdf, Twdp). K-Ar age 5.15±0.17 Ma

EXTRUSIVE AND INTRUSIVE ROCKS OF QUATERNARY AND TERTIARY AGE OF MAJOR ERUPTIVE CENTERS

Sitgreaves Mountain

RHYOLITE AND BRECCIA OF PLEISTOCENE (MATUYAMA) AGE

Qsr Rhyolite summit dome--Large endogenous-dome complex, approximately 4 km in diameter, forms summit of Sitgreaves Mountain. Rhyolite is light gray to yellowish gray, nearly aphyric, and pervasively jointed. Rare plagioclase phenocrysts occur in a microcrystalline groundmass of plagioclase, alkali feldspar, quartz, magnetite, and rare oxidized biotite(?). For composition see analysis 3430. Rhyolite is exposed mostly as surface debris of angular pebble- and cobble-size fragments that apparently broke off along the pervasive joints. The brittle rhyolite shed voluminous alluvial fan deposits represented by deeply dissected alluvium (Qal) on the lower slopes of Sitgreaves Mountain. Dome is partly surrounded by a breccia collar (Qsbc) of volcanic and Paleozoic sedimentary rock fragments. K-Ar age 1.90±0.12 Ma. Polarity reversed

Qsbc Breccia collar--Poorly exposed megabreccia partly encircling the rhyolite summit dome of Sitgreaves Mountain (Qsr). Breccia consists of fragments, blocks, and slabs of rhyolite, dacite, volcanic ash, minor basalt, and sandstone and rare limestone or dolomite of the Supai Formation, Coconino Sandstone, and Kaibab(?) Formation

DACITE AND TUFF OF PLEISTOCENE OR PLIOCENE (MATUYAMA) AGE

QTsd Dacite dome of southern Sitgreaves Mountain--Dome, 1 km in diameter, on south flank of Sitgreaves Mountain. Dacite contains abundant large phenocrysts of plagioclase (≤1 cm), conspicuous clear phenocrysts of pale-pink quartz (≤5 mm), subordinate small phenocrysts of hornblende and biotite (≤1 mm) mostly altered to opaque oxide, and rare phenocrysts of apatite (≤1 mm). Groundmass is hyalopilitic and contains the same minerals plus abundant tablets of alkali feldspar in a mesostasis of glass or, where the glass is devitrified, of a felsic cryptocrystalline aggregate. For composition see analysis 2405A (Central map). Locally the dacite contains xenoliths of amphibolite. Polarity normal

QTst Tuff--Light-gray tuff adjacent to the northwest flank of dacite dome of southern Sitgreaves Mountain (QTsd) and, in part, between the dacite and the rhyolite of Eagle Rock (Tsre). Contains xenoliths of fine-grained metamorphic rock, red sandstone similar to that of the Supai Formation (present in map area only in subsurface), basalt, dacite similar to that of the dacite dome of southern Sitgreaves Mountain (QTsd), and rhyolite similar to that of a rhyolite dome (Tsrc) east of map area. Tuff is well indurated, massive, and shows crude, nearly vertical, close-spaced jointing. It may have been deposited as an early pyroclastic phase of the eruption of the dacite dome of southern Sitgreaves Mountain (QTsd)

RHYOLITE AND PUMICE OF PLIOCENE (MATUYAMA) AGE

Tsre Rhyolite dome and flows of Eagle Rock--Elongate dome that extends east of map area on the south flank of Sitgreaves

Mountain and scattered exposures of a flow or flows west of the mountain. Rhyolite is largely flow banded, glassy, medium or dark gray to pale reddish brown. Where devitrified, it is light gray. Rhyolite contains abundant phenocrysts and microphenocrysts of sanidine and albite typically ≤3 mm in diameter, but some are ≤1 cm. Phenocrysts of pale-pink, vitreous quartz, about 3 mm in diameter, are widely scattered. Abundant biotite flakes ≤1.5 mm in diameter that are oriented with the basal cleavage parallel to the flow banding are particularly characteristic. Groundmass is usually clear glass, but, where devitrified, it is a feldspar-rich microcrystalline aggregate. For composition see analysis 3335. K-Ar age for the associated pumice and ash (Tsp) is 2.30±0.87 Ma. Polarity reversed

Tsp — Pumice and ash--Ash and lapilli, light-gray, pumiceous, consists of biotite rhyolite, exposed beneath rhyolite flows of Eagle Rock (Tsre) west of Sitgreaves Mountain and east of map area. Rhyolite fragments of the unit are petrographically similar to the rhyolite of Eagle Rock (Tsre). Unit contains ubiquitous accidental clasts of Precambrian chlorite schist, some with relict volcanic textures. Such clasts are commonly 1-2 cm in diameter, but some are ≤15 cm; the larger clasts are well rounded. Ash that may be correlative with this unit is included in the breccia collar (Qsbc) on the north flank of Sitgreaves Mountain. Lithologic similarity to and spatial association with rhyolite of Eagle Rock (Tsre) suggest that the pumice and ash may have been deposited as an early pyroclastic phase of eruption of the rhyolite of Eagle Rock. K-Ar age of a biotite rhyolite clast is 2.30±0.87 Ma

RHYOLITE OF PLIOCENE (GAUSS) AGE

Tsrv — Rhyolite vitrophyre flows--Flows, mainly dense porphyritic obsidian; exposed in scattered outcrops west of Sitgreaves Mountain, on north flank of the mountain (where the vitrophyre was apparently tilted during emplacement of the rhyolite summit dome (Qsr)), and east of map area. Vitrophyre contains abundant phenocrysts of plagioclase, sanidine, and intensely resorbed quartz and scattered phenocrysts of largely oxidized biotite, all set in a glassy groundmass. For composition see analysis 3333A. East of Sitgreaves Mountain (Central map) the unit has a K-Ar age of 2.84±0.02 Ma. Polarity normal

Bill Williams Mountain

EXTRUSIVE AND INTRUSIVE ROCKS OF PLIOCENE (GAUSS AND GILBERT) AGE

Twa — Andesite flows and domes--Flows extruded from bases of dacite domes on north side of Bill Williams Mountain and two small domes (the Railroad domes) north of Williams. Maximum thickness of flows is about 110 m and of domes about 50 m. Unit typically contains abundant phenocrysts of plagioclase (≤1 cm), which is corroded and sieved, and hornblende. Hornblende prisms in the flows are ≤1 mm long and are usually altered to opaque oxide or biotite, whereas in the domes they are ≤1 cm long and are unaltered. Sparse corroded quartz grains (≤5 mm) enclosed by pyroxene reaction rims occur consistently. Groundmass is fine grained and pilotaxitic to glassy and hyalopilitic; it normally contains tabular or microlitic plagioclase, pyroxene, opaque oxide, and glass and is generally more crystalline than that of the dacites (Twd, Twdd, and Twdf). For composition see analyses 1204, 1206 (flows) and 2221, 2222A (domes). K-Ar ages 2.85±0.91, 3.23±0.60, and 3.48±0.05 Ma. Polarity normal

Twbn — Benmoreite flow--Flow, characteristically shows sheetlike jointing, ≥60 m thick, extruded from west base of dacite dome (Twdd) that forms Bixler Mountain. Benmoreite contains scattered phenocrysts of corroded and sieved plagioclase (≤5

mm), altered hornblende (≤3 mm), and corroded quartz (≤4 mm). It also contains microphenocrysts of plagioclase that are gradational in size to plagioclase in the groundmass, which, in addition, contains olivine (altered to iddingsite), apatite, opaque oxide, and glass. Groundmass texture ranges from hyalopilitic where flow is glassy to pilotaxitic where it is more crystalline. For composition see analysis 1122. Unit is both overlain and underlain by basalt flows (Tyb). K-Ar age 2.94±0.57 Ma. Polarity reversed

Twd Dacite flows and intrusive rocks of central complex--Thick undivided flows and intrusive rocks of largely homogeneous, porphyritic dacite that forms the central and major part of Bill Williams Mountain. Unit includes spinelike ridges of dacite that are approximately radial to the mountain center, commonly contain vertical vesicle trains, and in which the dacite has a chalky altered appearance; the ridges may represent the upper part of a radial feeder-dike system. Dacite is generally similar in lithology to dacite domes (Twdd) and flows (Twdf) of Bill Williams Mountain. It contains abundant large (≤2 cm) phenocrysts of plagioclase that are moderately corroded and sieved and smaller (≤3 mm) phenocrysts of hornblende and biotite that are altered to opaque oxide; additional phenocrysts of quartz, unaltered biotite, and clinopyroxene occur locally. Groundmass consists of the same minerals plus hypersthene. For composition see analyses 1217, 1217C, 1218D, 1220. Microdiorite xenoliths similar to those in dacite domes (Twdd) are common. K-Ar age 3.56±0.38 Ma. Polarity, measured at one locality, normal

Twdd Dacite domes--Domes, light- to medium-gray, circular to irregularly shaped, 0.25-1.9 km in diameter, 75-305 m high. Most are peripheral to central complex of Bill Williams Mountain (Twd), but two occur in the summit area, and several occur to the northeast in the vicinity of Reneke Knoll and High School Hill. Dacite contains abundant large (usually 0.5-1 cm long, but locally ≤3 cm) phenocrysts of corroded and sieved plagioclase. Smaller (≤3 mm) phenocrysts of hornblende, biotite, and opaque oxide (mainly magnetite) are common. Phenocrysts and glomerocrysts of clinopyroxene (≤3 mm) and phenocrysts of quartz (≤1 cm) are abundant in the domes at the summit of Bill Williams Mountain but are sparse in the other domes. Phenocrysts of biotite are abundant only in the Reneke Knoll dome. For representative compositions see analyses 1221 (typical dome peripheral to Bill Williams Mountain), 1202 (outlying biotite-rich dacite of Reneke Knoll dome), and 1217B (pyroxene- and quartz-rich dacite of summit dome). K-Ar ages 3.59±0.13, 3.62±0.33, 3.72±0.21, 3.88±0.44, 4.17±1.06, 4.22±0.26 Ma. Polarity normal and reversed.

Microdiorite xenoliths are widely scattered in this unit. Xenoliths are medium to dark gray, commonly vesicular, spherical to irregularly shaped, 1-10 cm in diameter. They consist of a fine- to medium-grained, pilotaxitic matrix of hornblende and plagioclase that contains sparse phenocrysts of corroded plagioclase, hornblende, or quartz. For composition see analyses 1207 and 2235

Twdf Dacite flows--Flows, light-gray, broad or elongate bodies of porphyritic dacite distinguished from dacite domes (Twdd) by their greater ratio of surface area to thickness and from the central complex (Twd) by their isolation from it. Unit includes flow of High School Hill, which may have buried its own vent, a flow extruded from the southwest flank of Wounded Ranger Knoll, and several flow outcrops separated from Bill Williams Mountain by Quaternary alluvial and colluvial deposits (Qal). Dacite contains abundant large (typically ≤2 cm long, but locally ≤4 cm) phenocrysts of corroded and sieved plagioclase. Smaller phenocrysts (≤4 mm) include hornblende,

which is common, and subordinate biotite. Phenocrysts of quartz (≤4 mm) are locally abundant. For typical composition see analyses 1203A, 2233B. One sample from the flow of High School Hill (analysis 2233) is transitional between andesite and dacite. K-Ar age, flow of High School Hill, 5.03±0.50 Ma, but the flow overlies a basalt flow (Tyb) with a K-Ar age of 4.03±0.51 Ma. Polarity, flow of High School Hill, normal

Twdp Dacite pyroclastic deposits--Airfall deposits of pumiceous dacite lapilli and fine ash distributed around Bill Williams Mountain as isolated outcrops, as pyroclastic collars around dacite domes (Twdd), and beneath parts of the dacite flow (Twdf) of High School Hill and andesite flows (Twa) south of Williams. Phenocrysts of the same minerals as in other dacite units related to Bill Williams Mountain occur in a glass-rich hyalophitic to hyalopilitic groundmass. Accidental clasts of Precambrian basement rocks including gneiss, schist, mylonite, and orthoquartzite are locally common. For composition see analyses 1203 and 1217A. K-Ar age of dacite clast from summit deposit is 3.49±0.06 Ma

Twdi Dacite dike--Dike, porphyritic, 180 m long, 5-10 m wide, feeder for small dacite dome (Twdd) on southeast flank of Bill Williams Mountain. Dacite contains abundant large (≤3 cm long) phenocrysts of sieved plagioclase and smaller (≤3 mm) phenocrysts of hornblende and quartz as well as scattered phenocrysts of biotite, hypersthene, and opaque oxide set in a glassy groundmass

SEDIMENTARY ROCKS OF MESOZOIC AND PALEOZOIC AGE

Rm MOENKOPI FORMATION (MIDDLE? AND LOWER TRIASSIC)--Reddish-brown, well-bedded siltstone, silty sandstone, and sandstone. Two small outcrops, erosional remnants beneath basalt flows (Tyb), occur about 4 km southwest of Howard Mesa

Pk KAIBAB FORMATION (LOWER PERMIAN)--Yellowish- to light-gray, well-bedded limestone, silty dolomite, dolomitic limestone, and pale- to moderate-red, limy siltstone and sandstone; commonly fossiliferous and cherty. Red siltstone and sandstone, 0-10 m thick, occur in upper 50 m of unit. A residual gravel of chert and limestone debris, normally 10-30 m thick, occurs at the top of an irregularly eroded karstic surface northwest of vent 3132 (KY Hills); local thickness of gravel is greater, approximately 100 m, in exposures in KY Canyon and Cataract Creek

Ptc TOROWEAP FORMATION AND COCONINO SANDSTONE, UNDIVIDED (LOWER PERMIAN)--Very light gray to very pale orange, cross-stratified, well-sorted, fine- to medium-grained sandstone and moderate-orange-pink siltstone. Unit occurs at west edge of map area. Thickness is at least 75 m in Ash Fork Draw; base is not exposed

ANALYTICAL DATA

Tables 1-5 present chemical data for rocks in the Southwest map area.

Table 1 lists general information about each analyzed rock.

Table 2 lists the complete analyses of major oxides in weight percent, the laboratory numbers, and the analysts.

Table 3 lists the major oxides normalized to 100 percent after subtraction of all analyzed water and CO_2, subtraction of sufficient CaO to combine with CO_2 in normative calcite, and adjustment of the FeO/Fe_2O_3 ratio.

The normative mineralogy of the volcanic rocks is sensitive to the proportions of FeO and Fe_2O_3. Therefore, the FeO/Fe_2O_3 ratio was adjusted in order to minimize the effect of oxidation of iron due to weathering or to other alteration and presumably brings the adjusted FeO/Fe_2O_3 value for most rocks closer to the original magmatic value. The adjusted iron ratio was computed from an equation for the least-squares fit through 15 points representing the least-oxidized 15 of 599 rocks from the entire volcanic field in an FeO/Fe_2O_3 versus SiO_2 diagram (fig. 2; an additional two points representing unusually high analyzed FeO/Fe_2O_3

were not included in controlling the line). The equation for the line, which gives adjusted FeO/Fe_2O_3 of approximately 5 in basalts and 2.5 in rhyolites, is:

$$FeO/Fe_2O_3=9.627-0.0921xSiO_2 \ .$$

Table 4 lists the CIPW normative minerals calculated for each of the analyses in table 3.

Table 5 lists the trace-element analyses for the map area.

The major oxides for most of the rocks were determined in U.S. Geological Survey laboratories in Menlo Park, Calif., Denver, Colo., Washington, D.C., Reston, Va., and Flagstaff, Ariz. The analyses done at Menlo Park and Denver (lab. nos. with prefixes M and D, respectively) were performed primarily by X-ray fluorescence spectroscopy. Analyses done at Washington or Reston that have laboratory numbers smaller than W179000 and at Flagstaff (lab. nos. without prefix) were performed by the rapid-rock procedure described by Shapiro and Brannock (1962) supplemented by atomic absorption. Analyses done at Washington that have laboratory numbers greater than W179000 were performed by the rapid-rock procedures of Shapiro (1967, 1975). Analyses of samples 1207 and 1218 (lab. nos. R21 and R12, respectively) were reported by Robinson (1913). Analyses of samples 2203, 2204, and 3226J (lab. nos. 297-63, SP135, and C387-2, respectively) were reported by Stoeser (1973). Trace-element analyses were conducted by quantitative X-ray spectroscopy, emission spectroscopy, and neutron-activation methods.

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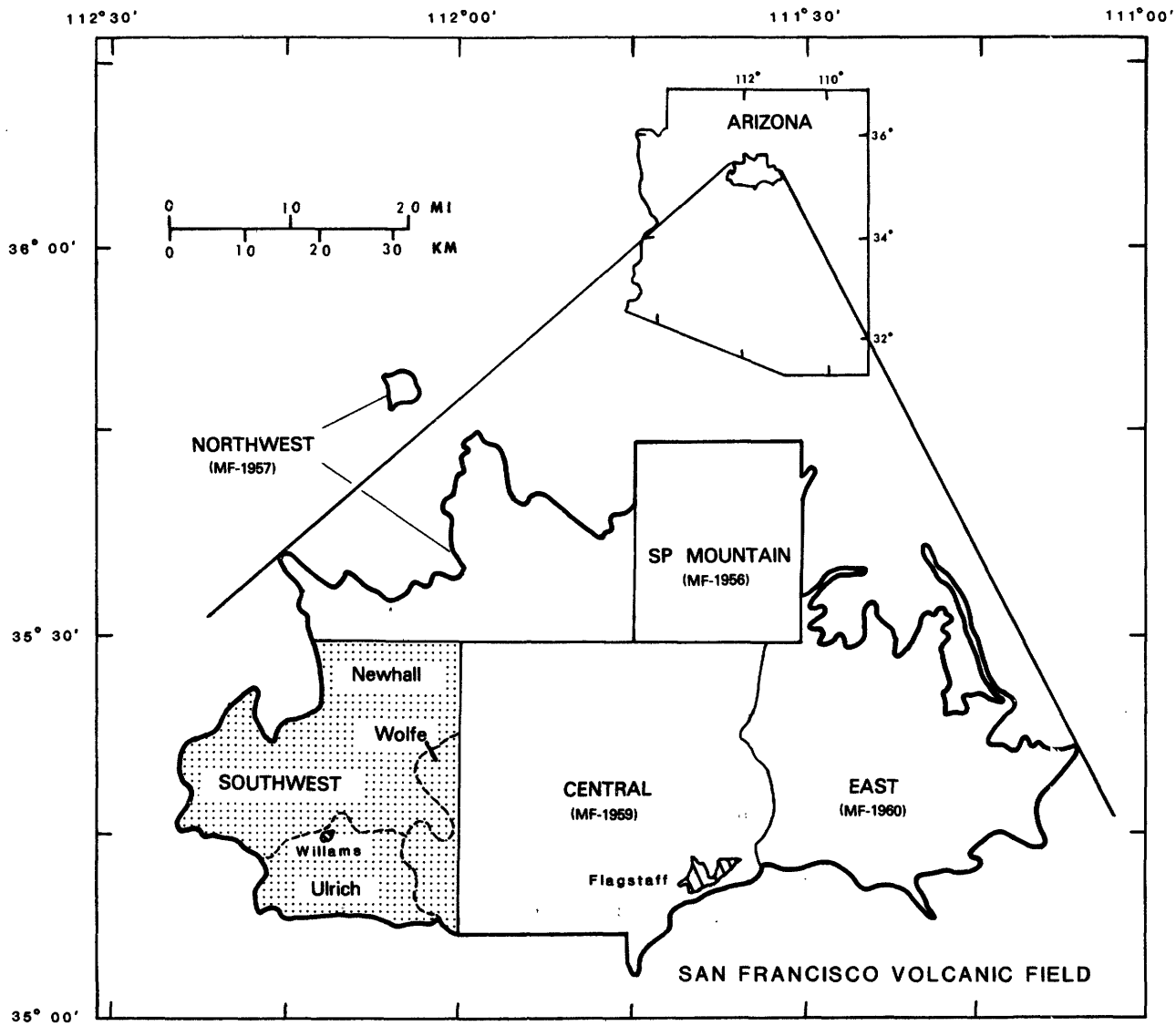

FIGURE 1.--Index map showing (1) location of the Southwest part of the San Francisco volcanic field, Arizona, (2) mapping responsibility in the Southwest map area, and (3) relation of the map of the Southwest part to other maps in this series that cover other parts of the volcanic field.

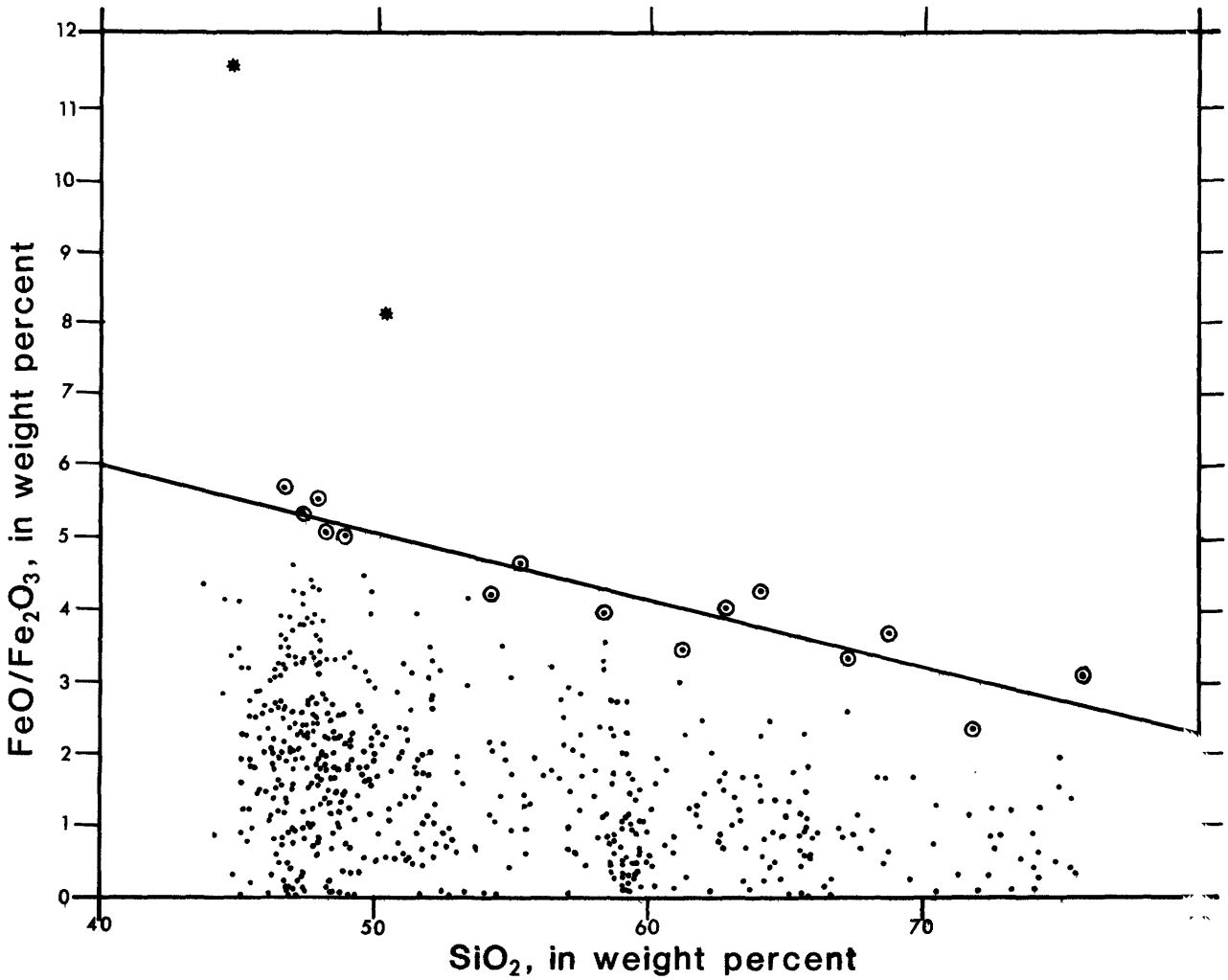

FIGURE 2.--Diagram showing variation of FeO/Fe_2O_3 versus SiO_2 for 601 volcanic rocks for which both FeO and Fe_2O_3 were analyzed. Line, described by the equation $FeO/Fe_2O_3=9.627-0.0921xSiO_2$, is a least-squares fit through 15 points (circled) that represent the highest values for FeO/Fe_2O_3 throughout the range of SiO_2 values. Note that two analyses (asterisks) with unusually high FeO/Fe_2O_3 were not included in controlling the position of the line.

TABLE 1. ANALYZED ROCKS IN THE SOUTHWEST MAP AREA

[ND, not determined]

Sample No.	Rock type	Vent[1] No.	Feature	Map unit	Basalt[2] type	Remarks
0301	BASALT	1430	Flow	QTb	i	
0305	BASALT	0305	--do--	Tyb	d	
1101	BASALT	2124	--do--	Tb	i	
1101A	BASALT	1101?	--do--	Tb	e	
1101B	BASALT	1101	Vent	Tb	d	
1102	BASALT	ND	Flow	Tob	b	
1103	BASALT	ND	--do--	Tob	d	
1104	BASALT	1104	--do--	Tb	d	
1105	BASALT	1105	Dike	Tbi	i	
1110	BASALT	1110	Flow	Tob	i	([3]).
1110A	BASALTIC ANDESITE	ND	--do--	Toab		
1110B	BASALT	ND	--do--	Tyb	i	
1111	BASALT	ND	--do--	Tb	i	
1122	BENMOREITE		--do--	Twbn		Bixler Mountain.
1123	BASALT	1123	Vent	Tyb	g	
1123A	BASALT	1123	--do--	Tyb	i	
1135	BASALT	1123	Flow	Tyb	g	([3]).
1136	BASALT	ND	--do--	Tyb	j	
1136A	BASALT	ND	--do--	Tyb	d	
1201	BASALT	1201	Vent	QTb	h	
1202	DACITE		Dome	Twdd		Reneke Knoll.
1203	DACITE		Pyroclastic sheet	Twdp		Bill Williams Mountain.
1203A	DACITE		Flow	Twdf		Wounded Ranger Knoll.
1204	ANDESITE		--do--	Twa		Bill Williams Mountain.
1206	ANDESITE		--do--	Twa		Do.
1207	MICRODIORITE		Xenolith	Twdd		Do.
1208	DACITE		Dome	Twdd		Bill Williams Mountain, peripheral dome.
1209	DACITE		--do--	Twdd		Do.
1209A	DACITE		--do--	Twdd		Do.
1209B	DACITE		--do--	Twdd		Do.
1209C	BASALT	1209	Accessory clast	Tb	i	
1212	BASALT	1212	Vent	QTb	g	
1215	BASALT	1215	--do--	QTb	c	

TABLE 1. ANALYZED ROCKS IN THE SOUTHWEST MAP AREA--Continued

Sample No.	Rock type	Vent[1] No.	Feature	Map unit	Basalt[2] type	Remarks
1215A	BASALT	ND	Flow	Tb	i	
1215B	GRANULITE	1216	Xenolith	Tb		
1215C	BASALT	1216	Vent	Tbt	b	
1215D	WEHRLITE	1216	Xenolith	Tbt		
1215E	WEBSTERITE	1216	--do--	Tbt		
1215F	PYROXENITE	1216	--do--	Tbt		
1215G	PYROXENITE	1216	--do--	Tbt		
1216	BASALT	ND	Flow	Tb	j	
1216A	BASALT	ND	Dike	Tbi	j	
1216B	BASALT	1222	Vent	Tob	j	
1217	DACITE		Flow	Twd		Bill Williams Mountain, central complex.
1217A	DACITE		Essential clast	Twdp		Bill Williams Mountain, summit airfall pumice.
1217B	DACITE		Dome	Twdd		Bill Williams Mountain, summit dome.
1217C	DACITE		Flow	Twd		Bill Williams Mountain, central complex.
1217D	DACITE		Dome	Twdd		Bill Williams Mountain, summit dome. ([4]).
1218	DACITE		--do--	Twdd		Bill Williams Mountain, peripheral dome.
1218B	DACITE		--do--	Twdd		Bixler Mountain dome.
1218C	BASALTIC ANDESITE	1218	Accessory clast	Tbt		([3]).
1218D	DACITE		Basal vitrophyre	Twd		Bill Williams Mountain, central complex. ([3]).
1218E	DACITE	1218	Accessory clast	Tbt		([3]).
1218F	BASALT	1218	Vent	Tbt	g	([3]).
1220	DACITE		Flow	Twd		Bill Williams Mountain, central complex.
1221	DACITE		Dome	Twdd		Bill Williams Mountain, peripheral dome.
1221A	PYROXENITE	ND	Xenolith	Tbt		([3]).
1221B	BASALT	1221	Vent	Tb	i	
1221C	BASALT	1221A	--do--	Tb	b	
1222	BASALT	1222	--do--	Tob	i	
1223	BASALT	1224	Flow	Tb	h	
1224	BASALT	1224A	Vent	QTb	g	
1224A	BASALT	1224	--do--	Tb	h	
1226	BASALT	1226	--do--	Tb	b	
1226A	BASALT	1211	Flow	Tyb	g	
1227	BASALT	1227	Vent	Tb	i	
1227A	BASALT	1227A	Flow	Tb	i	

1227B	BASALT	1222	--do--	Tob	i	
1229	BASALT	1219	--do--	QTmb	i	
1231	BASALT	ND	--do--	Tyb	b	
1231A	DACITE		Dome	Thcd		Hell Canyon. [3].
1231B	BASALT	ND	Flow	Tob	e	
1231C	BASALT	1232	--do--	Tob	i	
1232	BASALTIC ANDESITE	1232	Vent	Toab		
1233	BASALT	1233	--do--	Tyb	j	[3].
1234	BASALT	1234A	--do--	Tb	b	
1234A	BASALT	1233	Dike	Tybi	a	[3].
1236	BASALT	1236	Vent	Tb	i	
1301	BASALT	2335A	Flow	QTmb	g	
1301A	BENMOREITE	1407	--do--	QTmbn		Horse Hill. [3].
1305	DACITE		Dome	QTdd		Davenport Hill.
1305A	ANDESITE	1305	Vent	QTda		Davenport Hill summit cone.
1309	BASALT	1316	--do--	QTb	h	
1311	BASALT	1311	Flow	QTb	i	
1312	DACITE	1407	--do--	QTmbn		Variant of Horse Hill benmoreite.
1315	BASALTIC ANDESITE	1315	Vent	QTab		
1316	BASALT	1316A	--do--	QTb	h	
1317	BASALT	1305	Flow	QTdba	h	
1319	BASALT	1319	Vent	Tb	c	
1320	ANDESITE	1305	Flow	QTdba		Davenport Hill flow.
1321	BASALT	ND	--do--	Tb	b	[3].
1328	BASALT	1329	--do--	Tb	d	
1330	BASALT	1330	--do--	Tb	b	
1330A	BASALT	1330A	Vent	Tb	g	
1331	BASALT	1331	--do--	Tb	f	[3].
1331A	BASALT	1331A	--do--	Tb	d	
1331B	BASALT	1329	Flow	Tb	a	
1331C	BASALT	ND	--do--	Tb	g	
1332	BASALT	1331	Dike	Tbi	f	
1334	BASALT	1334	Vent	Tyb	d	
1418	ANDESITE	1407	Flow	QTmbn		Variant of Horse Hill benmoreite. [3].
1419	ANDESITE	1407	--do--	QTmbn		Do.
1419A	BASALT	1419	Vent	QTmb	d	[3].
1419B	ANDESITE	1419	Flow	QTmab		[3].
1419C	BASALT	1419	--do--	QTmba	e	
1430	BASALT	1430	Vent	QTmb	b	

TABLE 1. ANALYZED ROCKS IN THE SOUTHWEST MAP AREA--Continued

Sample No.	Rock type	Vent[1] No.	Feature	Map unit	Basalt[2] type	Remarks
2101	BASALT	2101	--do--	Tb	i	
2102	BASALT	2112	Flow	Tb	i	
2104	BASALT	2104	Vent	Tb	g	
2105	BASALT	2105	--do--	Tb	i	
2105A	BASALT	2105	Flow	Tb	b	
2105B	BASALT	2105	--do--	Tb	g	
2105C	BASALT	2105B	Vent	Tb	h	
2107	BASALT	2122	Flow	Tb	j	
2108	BASALT	2108	--do--	Tb	i	
2109	BASALT	2109	--do--	Tb	i	
2109A	BASALT	2116	Vent	Tb	i	
2110	BASALT	2110	Flow	Tb	j	
2110A	BASALT	2110	Vent	Tb	j	
2111	BASALT	2112	Dike	Tbi	b	
2112	BASALT	2112	Vent	Tb	h	
2113	BASALT	2113	Flow	Tb	c	
2113A	BASALT	ND	--do--	Tb	f	[3].
2114	BASALT	2114	Vent	Tb	i	
2114A	BASALT	2114A	--do--	Tb	i	[3].
2119	BASALT	2119	Flow	Tb	h	
2121	BASALT	2127	--do--	Tb	b	[3]..
2122	BASALT	2122	Vent	Tb	j	[3].
2124	BASALT	2124	--do--	Tb	i	
2124A	BASALT	2124	Dike	Tbi	b	
2124B	BASALT	2124	--do--	Tbi	i	
2124C	BASALT	2124	--do--	Tbi	i	[3].
2124D	BASALT	2124	--do--	Tbi	i	
2124E	BASALT	2124	--do--	Tbi	f	[3].
2124F	BASALT	2124B	Vent	Tb	j	[3].
2125	BASALT	2125B	Flow	Tb	j	
2126	BASALT	2126	Vent	Tb	i	
2126A	BASALT	2122	Flow	Tb	j	
2127	BASALT	2128	--do--	Tb	h	
2128	BASALT	2127B	--do--	Tb	j	

2131	BASALT	2131	Vent	Tb	i	
2132	BASALT	2133A	Flow	Tb	i	
2132A	BASALT	2133A	--do--	Tb	f	
2133	BASALT	2133B	Vent	Tb	h	
2134	BASALT	2127B	Flow	Tb	j	
2135	BASALTIC ANDESITE	2135	--do--	Toab		
2135A	BASALT	2136A	--do--	Tob	j	
2135B	BASALT	ND	--do--	Tb	i	[3].
2136	BASALT	2136A	Vent	Tob	j	
2136A	BASALTIC ANDESITE	2135	--do--	Toab		[3].
2201	BASALT	2215	Flow	Tyb	i	
2203	BASALT	2203	Vent	QTmb	i	
2204	BASALT	2203	Flow	QTmb	i	
2207	BASALT	2220	--do--	Tyb	e	
2209	BASALT	2220	--do--	Tyb	e	
2209A	BASALT	2220	--do--	Tyb	e	
2212	BASALT	2212	--do--	QTmb	i	
2213	BASALT	2319B	--do--	QTb	g	
2217	BASALT	2220	--do--	Tyb	h	
2217A	BASALTIC ANDESITE	2218	Flow	Tab		
2217B	BASALT	2217	Vent	Tb	a	
2218	BASALTIC ANDESITE	ND	Flow	Tab		[3].
2219	BASALT	2219	Vent	Tb	b	
2220	BASALT	2219	Flow	Tb	j	
2221	ANDESITE		Dome	Twa		Railroad dome north of Williams.
2222A	ANDESITE		--do--	Twa		Do.
2223	BASALT	2222	Flow	Tyb	e	[3].
2223A	BASALT	2319A	--do--	QTb	i	
2226	BASALT	1202	--do--	Tyb	h	
2230	BASALT	2230	--do--	Tb	g	[3].
2232	BASALT	2232	Vent	Tb	h	
2233	DACITE		Flow	Twdf		High School Hill.
2233A	BASALT	ND	--do--	Tyb	i	
2233B	DACITE		--do--	Twdf		High School Hill.
2234	BASALT	ND	--do--	Tyb	k	
2235	MICRODIORITE		Xenolith	Twdd		Bill Williams Mountain.
2302	BASALT	3335	Flow	Qmb	i	
2304	BASALT	2304	Vent	QTb	h	
2307	BASALT	ND	Flow	QTb	e	

TABLE 1. ANALYZED ROCKS IN THE SOUTHWEST MAP AREA--Continued

Sample No.	Rock type	Vent[1] No.	Feature	Map unit	Basalt[2] type	Remarks
2307A	BASALT	2308	--do--	QTmb	h	
2309	BASALT	2303	--do--	QTmb	d	
2309A	BASALT	2308A	--do--	QTmb	h	
2311	BASALT	2301	--do--	Qmb	f	
2313	BASALT	2418	--do--	Qmb	h	
2316	BASALT	2316	--do--	QTmb	g	
2317	BASALT	2317	--do--	QTmb	d	
2317A	BASALT	2317	Vent	QTmb	d	
2318	BASALT	2320	Flow	Tyb	i	
2319	BASALT	2319	--do--	Tyb	i	
2322	BASALT	2316A	--do--	QTmb	h	
2323	BASALT	2324	Vent	QTmb	h	
2325	BASALT	2325	Flow	QTmb	h	
2332	BASALT	2332	Vent	QTb	i	
2332A	BASALT	2329	--do--	QTb	g	
2332B	ANDESITE	1305	Flow	QTdba		Davenport Hill flow.
2333	BASALT	1303	--do--	QTb	h	
2334	BASALT	2327	--do--	QTb	i	
2335	BASALT	2335	Vent	QTb	b	
2335A	BASALT	2325	Flow	QTmb	e	
2430	BASALT	2430	Vent	QTmb	h	
2Z03	BASALT	2Z03	Flow	Tb	b	
2Z03A	BASALT	3Z33	--do--	Tb	i	
2Z13	BASALT	2133	--do--	Tb	d	
2Z14	BASALT	2119	--do--	Tb	h	
2Z14A	BASALT	2119?	--do--	Tb	h	
2Z15	BASALT	2133?	--do--	Tb	d	
2Z15A	BASALT	2Z23A	--do--	Tb	h	
2Z23	BASALT	2Z24	--do--	Tb	b	
2Z23A	BASALT	2Z23	--do--	Tb	i	
2Z24	BASALT	2Z24	--do--	Tb	i	
2Z25	BASALT	2Z25	--do--	Tb	b	
2Z25A	BASALT	2Z25	--do--	Tb	i	
2Z25B	BASALT	2Z25A	Dike	Tbi	h	([3]).

2Z25C	BASALT	2Z25A	--do--	Tbi	i	
2Z25D	BASALT	2Z25	--do--	Tbi	b	[3].
2Z26	BASALT	2Z26	Flow	Tb	b	
2Z27A	BASALT	2Z27	Vent	Tb	i	
2Z28	BASALT	ND	Flow	Tb	i	
3113	BASALT	3113	Vent	QTmb	i	
3117	BASALT	3118	Flow	Tb	b	
3120	BASALT	3118	--do--	Tb	j	
3121	BASALT	3121A	--do--	Tb	c	
3121A	BASALT	3121	--do--	Tb	a	
3121B	BASALT	3118	--do--	Tb	i	
3126	BASALT	3126	Vent	Tb	b	
3134	BASALT	3135	Flow	Tb	i	
3134A	BASALT	3133	--do--	Tb	g	
3134B	BASALT	3133	--do--	Tb	d	
3135	BASALT	3136	--do--	Tb	i	
3135A	BASALT	3136	--do--	Tb	i	
3136	BASALT	3135	--do--	Tb	i	
3201	BASALT	3306A	--do--	QTmb	h	
3211	BASALT	3202	--do--	QTmb	b	
3212	BASALT	3307	--do--	Tyb	i	
3212A	BASALT	3212	Vent	QTb	b	
3214	BASALT	3212	Flow	QTb	b	
3215	BASALT	3215	Vent	QTb	a	
3218	BASALT	3229?	Flow	QTmb	i	
3221	BASALT	3221	Vent	QTmb	b	
3222	BASALT	3229	Flow	QTmb	b	
3223	BASALT	ND	--do--	QTmb	h	
3226	BASALT	3226	Vent	QTmb	d	[3].
3226A	GABBRO	3226	Xenolith	QTmb		[3].
3226B	GABBRO	3226	--do--	QTmb		[3].
3226C	DUNITE	3226	--do--	QTmb		[3].
3226D	PERIDOTITE	3226	--do--	QTmb		[3].
3226E	PERIDOTITE	3226	--do--	QTmb		[3].
3226F	PERIDOTITE	3226	--do--	QTmb		[3].
3226G	PERIDOTITE	3226	--do--	QTmb		[3].
3226H	PYROXENITE	3226	--do--	QTmb		[3].
3226J	BASALT	3226	--do--	QTmb	d	
3226K	DUNITE	3226	--do--	QTmb		[3].

TABLE 1. ANALYZED ROCKS IN THE SOUTHWEST MAP AREA--Continued

Sample No.	Rock type	Vent[1] No.	Feature	Map unit	Basalt[2] type	Remarks
3226L	PYROXENITE	3226	--do--	QTmb		[3].
3226M	PYROXENITE	3226	--do--	QTmb		[3].
32260	BASALT	3226A	Flow	QTmb	h	[3].
3226P	BASALT	3226A	--do--	QTmb	b	
3228	BASALT	3226A	--do--	QTmb	b	
3228A	BASALT	3221	--do--	QTmb	i	
3235	BASALT	3226A	--do--	QTmb	b	
3236	BASALT	3236	Vent	QTmb	b	
3236A	BASALT	3331	Flow	QTmb	i	
3236B	BASALT	3236B	Vent	QTmb	i	
3236C	BASALT	3236C	--do--	QTb	i	
3301	BASALT	3301	--do--	QTmb	h	
3304	BASALT	3304	--do--	Tyb	i	
3305	BASALT	3304A	Flow	Tyb	h	
3305A	BASALT	4332A	--do--	Tyb	h	
3305B	BASALT	3305	--do--	QTmb	i	
3307	BASALT	3307	Dike	Tybi	h	
3311	BASALT	3311	Flow	QTmb	h	
3313	BASALT	3407	--do--	QTmb	f	
3319	BASALT	3310	--do--	QTmb	g	
3323	BASALT	3325A	--do--	QTmb	d	
3324	BASALT	3324	--do--	QTmb	d	
3325	BASALT	3430	--do--	Qmb	d	
3326	BASALT	3325	--do--	QTmb	d	
3327	BASALT	3327	--do--	QTmb	i	
3331	BASALT	3331	--do--	QTmb	h	
3333	BASALT	3335	--do--	Qmb	i	
3333A	RHYOLITE		--do--	Tsrv		Rhyolite vitrophyre of Sitgreaves Mountain.
3335	RHYOLITE		Dome	Tsre		Rhyolite of Eagle Rock.
3406	BASALT	3406	Vent	QTmb	b	
3407	BASALT	3407	Dike	QTmbi	e	[3].
3407A	BASALT	3407	--do--	QTmbi	d	[3].
3407B	METASANDSTONE	3407	Xenolith	QTmbi		[3].
3430	RHYOLITE		Dome	Qsr		Sitgreaves Mountain summit. [3].

3Z13	BASALT	3Z13	Flow	Tb	i	
3Z13A	BASALT	3118	--do--	Tb	j	
3Z22	BASALT	3Z23A	--do--	Tb	j	
3Z26	BASALT	3Z33	--do--	Tb	i	
3Z33	BASALT	3Z33A	Vent	Tb	b	
3Z36	BASALT	3132A	Flow	Tb	h	
3Z36A	BASALT	3132	--do--	Tb	i	
4213	ANDESITE		--do--	Tmha		Howard Hill.
4214	BASALT	4226A	--do--	Tyb	e	
4225	BASALT	4225	Vent	QTb	d	
4226	BASALT	4226	--do--	QTmb	i	
4227	BASALT	4236	Flow	Tyb	e	
4234	BASALT	4236A	--do--	Tyb	i	
4236	BASALT	4236	Vent	Tyb	e	
4236A	BASALT	4236A	--do--	Tyb	h	
4301	BASALTIC ANDESITE	4301	--do--	QTmab		
4302	BASALT	4302	--do--	QTmb	h	
4302A	BASALT	4302A	--do--	Qbmb	i	
4303	BASALT	4311A	Flow	QTmb	b	
4311	BASALT	4311A	--do--	QTmb	b	
4313	BASALT	4313	Vent	QTmb	g	
4313A	BASALT	4425	Flow	Qbmb	g	
4314	BASALTIC ANDESITE	4301	--do--	QTmab		([3]).
4315	BASALT	4314	--do--	QTmb	g	
4316	BASALT	4332A	--do--	Tyb	h	
4319	BASALT	3306?	--do--	QTmb	b	
4321	BASALT	4327	--do--	QTmb	d	
4322	BASALT	4326	--do--	QTmb	d	
4323	BASALT	4323	--do--	QTmb	f	
4323A	BASALT	4323B	Vent	QTb	h	
4324	BASALT	4324	--do--	QTmb	b	
4324A	BASALT	4324	--do--	QTmb	b	
4325	BASALT	4325	Flow	QTmb	g	
4326	BASALT	4325	Vent	QTmb	b	
4328A	BASALT	4328A	--do--	QTb	h	
4331	BASALT	3306	Flow	QTmb	b	
4332	BASALT	ND	--do--	QTb	g	
4336	BASALT	4336	Flow	QTmb	h	
4406	BASALT	4301	--do--	In QTmab	b	([3]).

TABLE 1. ANALYZED ROCKS IN THE SOUTHWEST MAP AREA--Continued

Sample No.	Rock type	Vent[1] No.	Feature	Map unit	Basalt[2] type	Remarks
4407A	BASALT	4418C	--do--	QTmb	i	
4418	ANDESITE	4418	Vent	QTma		
4418A	BASALTIC ANDESITE	4418A	--do--	QTmab		
4430	BASALT	4430	--do--	QTsb	i	
4431	BASALTIC ANDESITE	4430	Flow	QTab		

[1]Blank entry indicates isolated domes or other volcanic units originating at nonbasaltic volcanic centers to which vent numbers were not assigned. Such volcanic loci are normally indicated under "Remarks."

[2]Blank entry indicates rock type other than basalt.

[3]For trace-element analyses see table 5.

[4]Only trace elements analyzed, table 5.

TABLE 2. COMPLETE ANALYSES OF OXIDES IN WEIGHT PERCENT, SOUTHWEST MAP AREA

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO[1]	MgO	CaO	Na_2O[2]	K_2O[2]	H_2O[3]	TiO_2	P_2O_5[2]	MnO[3]	CO_2[3]	Total	Lab. No.	Analysts[4]
0301	46.34	17.83	11.78	0.00	7.45	10.43	3.07	0.86	0.00	1.26	0.39	0.16	0.00	99.57	M136987	LE
0305	47.13	14.87	10.99	0.00	11.11	10.13	2.69	0.84	0.00	1.46	0.31	0.16	0.00	99.69	M138255	JC
1101	45.14	16.94	13.11	0.00	7.61	10.59	3.28	1.11	0.00	2.44	0.69	0.00	0.00	100.91	M131510	LE
1101A	52.23	17.59	9.90	0.00	3.96	7.02	4.39	1.87	0.00	1.65	0.78	0.00	0.00	99.39	M131511	LE
1101B	47.93	17.60	11.44	0.00	5.76	9.71	3.73	1.46	0.00	1.70	0.70	0.00	0.00	100.03	M131512	LE
1102	45.42	16.80	12.80	0.00	7.08	10.48	3.10	1.15	0.00	2.42	0.69	0.19	0.00	100.13	M138224	SK
1103	53.30	14.29	8.02	0.00	7.11	7.89	3.32	2.01	0.00	1.21	0.52	0.15	0.00	97.82	M138223	SK
1104	47.57	16.69	12.04	0.00	7.09	8.34	3.59	1.25	0.00	2.43	0.53	0.17	0.00	99.70	M138230	SK
1105	49.84	16.88	10.51	0.00	6.04	8.59	3.64	1.34	0.00	1.82	0.58	0.15	0.00	99.39	M138231	SK
1110	47.45	17.24	8.31	2.71	5.11	9.71	3.36	1.26	1.37	1.78	0.72	0.17	1.10	100.29	M129291	HE,LE,JT
1110A	54.88	15.16	7.84	0.00	4.97	8.15	3.58	2.11	0.00	1.20	0.53	0.14	0.00	98.56	M138222	SK
1110B	48.83	17.97	11.66	0.00	5.65	9.22	2.89	1.39	0.00	1.76	0.71	0.18	0.00	100.26	M138280	JC
1111	48.57	17.68	11.56	0.00	4.94	9.34	3.22	1.43	0.00	1.72	0.73	0.16	0.00	99.35	M138281	JC
1122	59.51	17.28	5.50	1.40	1.02	3.90	5.79	2.40	0.95	1.04	0.70	0.13	0.12	99.74	M129289	HE,LE,JT
1123	46.80	16.38	12.00	0.00	7.71	11.15	3.10	1.10	0.00	1.90	0.61	0.00	0.00	100.75	M131484	LE
1123A	47.65	17.15	11.87	0.00	5.59	10.92	3.36	1.42	0.00	1.64	0.69	0.00	0.00	100.29	M131485	LE
1135	45.60	15.80	3.80	6.83	7.41	11.95	3.05	1.20	0.57	1.62	0.82	0.19	0.26	99.10	M129290	HE,LE,JT
1136	45.78	14.41	11.68	0.00	9.33	14.12	2.06	0.56	0.00	1.22	0.70	0.00	0.00	99.86	M131499	LE
1136A	49.55	16.61	11.31	0.00	6.24	8.41	3.75	1.42	0.00	1.99	0.60	0.00	0.00	99.88	M131500	LE
1201	45.15	17.33	11.06	0.00	6.72	12.24	2.37	1.26	0.00	1.79	0.66	0.18	0.00	98.76	M137102	GK
1202	63.43	15.77	4.07	0.00	1.33	3.58	4.04	2.85	0.00	0.64	0.46	0.08	0.00	96.25	M137104	GK
1203	63.99	14.73	1.46	2.44	1.82	3.72	3.79	2.95	4.00	0.66	0.15	0.08	0.04	99.83	M129294	HE,LE,JT
1203A	65.57	15.50	1.81	2.09	1.33	3.34	4.29	3.30	1.63	0.67	0.18	0.08	0.03	99.82	M129327	HE,LE,JT
1204	57.55	16.83	3.72	4.48	1.97	5.10	5.09	2.05	1.06	1.35	0.57	0.14	0.06	99.97	M129286	HE,LE,JT
1206	60.67	17.08	3.38	2.37	1.86	4.46	4.24	2.48	1.76	0.93	0.33	0.11	0.06	99.73	M129283	HE,LE,JT
1207	53.97	16.00	4.56	3.63	6.36	7.47	4.38	1.23	1.34	1.46	0.10	0.00	0.00	100.50	R21	RM
1208	64.64	15.66	1.83	2.45	1.60	3.63	4.10	3.01	2.05	0.76	0.20	0.09	0.07	100.09	M129301	HE,LE,JT
1209	62.74	16.69	2.64	1.73	1.39	4.14	4.18	2.72	2.06	0.75	0.21	0.09	0.67	100.01	M129292	HE,LE,JT
1209A	63.20	16.58	1.89	2.60	1.68	4.08	4.22	2.92	1.22	0.88	0.19	0.09	0.28	99.83	M129293	HE,LE,JT
1209B	64.17	16.37	2.86	1.60	1.44	4.09	4.45	2.59	1.29	0.75	0.22	0.09	0.14	100.02	M129298	HE,LE,JT
1209C	46.50	17.49	3.93	5.86	5.38	10.55	3.20	1.25	1.83	1.77	0.62	0.17	2.08	100.63	M129302	HE,LE,JT
1212	45.78	18.11	10.93	0.00	6.96	11.02	3.00	1.08	0.00	1.86	0.51	0.17	0.00	99.42	M137103	GK
1215	48.75	17.34	10.41	0.00	4.96	8.97	3.94	1.63	0.00	1.69	0.51	0.00	0.00	98.20	M131489	LE
1215A	45.23	17.01	11.59	0.00	7.84	12.94	2.80	0.75	0.00	1.66	0.71	0.00	0.00	100.53	M131492	LE

TABLE 2. COMPLETE ANALYSES OF OXIDES IN WEIGHT PERCENT, SOUTHWEST MAP AREA--Continued

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO[1]	MgO	CaO	Na_2O[2]	K_2O[2]	H_2O[3]	TiO_2	P_2O_5[2]	MnO[3]	CO_2[3]	Total	Lab. No.	Analysts[4]
1215B	68.97	16.97	2.19	0.03	0.49	3.38	5.55	1.27	0.51	0.27	0.06	0.03	0.08	99.80	M131382	MV,SN
1215C	47.83	15.22	4.68	5.67	7.73	11.17	3.00	0.88	1.43	1.66	0.40	0.16	0.10	99.93	M131383	MV,SN
1215D	41.19	5.72	17.09	0.00	28.79	6.33	0.64	0.01	0.00	0.59	0.03	0.18	0.00	100.57	M133119	LE
1215E	41.25	8.30	17.20	0.00	17.81	8.29	1.21	0.10	0.00	1.27	0.02	0.19	0.00	95.64	M133120	LE
1215F	45.33	7.20	11.93	0.00	13.97	15.73	1.12	0.03	0.00	1.19	0.00	0.27	0.00	96.77	M133121	LE
1215G	47.69	5.85	7.38	0.00	15.94	18.70	0.86	0.05	0.00	0.74	0.08	0.16	0.00	97.45	M133122	LE
1216	43.89	13.74	1.99	8.62	8.87	14.69	2.29	0.45	1.48	1.51	0.67	0.19	1.54	99.93	M129297	HE,LE,JT
1216A	44.80	14.95	11.42	0.00	10.47	13.30	2.79	1.08	0.00	1.45	0.86	0.00	0.00	101.12	M131493	LE
1216B	45.00	13.70	11.60	0.00	9.34	15.60	2.06	0.44	0.54	1.52	0.69	0.22	0.00	100.71	D235644	JW,JTG,JB
1217	64.48	16.34	3.16	1.31	1.55	3.88	4.65	2.68	0.70	0.83	0.17	0.08	0.10	99.93	M129299	HE,LE,JT
1217A	63.33	16.08	1.80	2.17	1.49	3.63	4.44	2.72	3.08	0.70	0.17	0.08	0.07	99.76	M129300	HE,LE,JT
1217B	65.90	15.80	2.80	1.47	1.60	3.90	4.20	2.60	0.90	0.69	0.20	0.06	0.02	100.14	W188075	LA
1217C	66.50	15.40	3.50	0.52	1.30	3.20	4.30	2.90	0.72	0.69	0.17	0.06	0.01	99.27	W188081	LA
1218	65.99	16.14	2.28	1.84	1.47	3.57	4.73	2.90	0.82	0.68	0.15	0.00	0.00	100.57	R12	HR
1218B	64.93	15.59	2.20	1.84	1.51	3.86	4.36	2.83	1.52	0.73	0.17	0.08	0.09	99.71	M129284	HE,LE,JT
1218C	55.54	12.40	3.38	4.76	6.88	7.76	3.34	2.73	0.84	1.62	0.40	0.13	0.09	99.87	M131434	MV,BK,PK
1218D	69.69	13.62	3.11	0.00	0.83	1.98	3.99	3.95	0.00	0.47	0.12	0.08	0.00	97.84	M131529	MV,BK
1218E	70.60	13.86	2.88	0.00	0.73	1.91	3.94	4.28	0.00	0.41	0.12	0.08	0.00	98.81	M131530	MV,BK
1218F	48.15	16.76	11.36	0.00	6.38	10.28	3.35	0.98	0.00	1.71	0.39	0.17	0.00	99.53	M131528	MV,BK
1220	64.63	15.85	2.84	1.34	1.64	3.78	3.95	3.26	1.76	0.70	0.17	0.08	0.05	100.05	M129287	HE,LE,JT
1221	65.71	15.22	2.02	1.77	1.51	3.57	4.33	2.87	1.60	0.66	0.15	0.08	0.17	99.66	M129295	HE,LE,JT
1221A	41.83	2.59	2.03	1.89	30.47	6.54	0.50	0.05	0.00	0.48	0.02	0.18	0.05	97.19	M129296	HE,LE,JT
1221B	52.40	18.66	10.28	0.00	4.67	7.66	3.89	1.18	0.00	1.61	0.28	0.00	0.00	100.63	M131486	LE
1221C	49.17	16.91	11.16	0.00	7.06	10.85	3.29	1.10	0.00	1.58	0.43	0.00	0.00	101.55	M131494	LE
1222	46.90	15.90	11.70	0.00	8.94	11.20	2.83	0.88	0.00	1.97	0.41	0.18	0.00	100.91	D235645	JW,JTG,JB
1223	51.80	18.00	10.55	0.00	2.84	5.96	4.75	1.73	0.00	1.93	0.65	0.15	0.00	98.36	M137109	GK
1224	52.94	15.02	9.53	0.00	6.17	8.17	3.56	1.64	0.00	1.63	0.44	0.00	0.00	99.10	M131498	LE
1224A	53.77	18.05	9.91	0.00	2.75	5.98	4.80	1.76	0.00	1.78	0.73	0.14	0.00	99.67	M137080	LE
1226	50.38	16.68	9.35	0.00	6.43	10.11	3.62	1.67	0.00	1.63	0.46	0.00	0.00	100.33	M131505	LE
1226A	50.20	17.38	11.66	0.00	6.23	8.42	3.93	1.04	0.00	1.82	0.45	0.00	0.00	101.13	M131506	LE
1227	52.59	16.00	9.46	0.00	5.32	9.18	3.77	2.08	0.00	1.44	0.61	0.00	0.00	100.45	M131495	LE
1227A	49.73	17.28	11.18	0.00	5.31	8.46	3.73	1.58	0.00	2.01	0.57	0.00	0.00	99.85	M131496	LE
1227B	46.61	16.45	11.78	0.00	8.72	11.71	2.92	0.79	0.00	1.90	0.36	0.00	0.00	101.24	M131507	LE
1229	52.86	18.91	9.97	0.00	4.91	7.91	3.86	1.20	0.00	1.56	0.28	0.00	0.00	101.46	M131508	LE

1231	45.97	15.15	11.94	0.00	8.94	12.27	2.86	0.98	0.00	1.77	0.58	0.00	0.00	100.46	M131501	LE
1231A	66.34	16.86	4.57	0.00	0.25	1.89	5.72	3.45	0.00	0.32	0.16	0.14	0.00	99.70	M131531	MV,BK
1231B	50.32	17.04	10.70	0.00	5.10	8.07	4.01	1.50	0.00	1.89	0.66	0.00	0.00	99.29	M131502	LE
1231C	49.60	16.80	11.20	0.00	5.91	8.56	3.59	1.46	0.84	1.97	0.66	0.18	0.00	100.77	D235646	JW,JTG,JB
1232	56.26	16.31	2.88	4.88	3.80	5.78	4.29	2.49	0.65	1.30	0.35	0.16	0.08	99.23	M131384	MV,SN
1233	46.48	15.27	11.28	0.00	8.87	13.03	3.02	0.65	0.00	1.37	0.70	0.00	0.00	100.67	M131503	LE
1234	45.22	15.75	11.46	0.00	9.05	12.58	2.97	0.97	0.00	1.44	0.68	0.00	0.00	100.12	M131504	LE
1234A	45.17	12.67	2.32	7.97	13.97	10.62	2.43	0.76	0.40	1.28	0.55	0.18	0.20	98.52	M131385	MV,SN
1236	47.25	17.91	11.64	0.00	5.47	9.24	3.69	0.62	0.00	2.05	0.50	0.18	0.00	98.55	M137120	GK
1301	43.97	12.37	11.59	0.00	12.67	12.54	2.50	0.41	0.00	1.89	0.74	0.19	0.00	98.87	M136978	LE
1301A	58.60	18.00	6.95	0.00	1.92	5.00	4.89	2.28	0.44	0.96	0.72	0.15	0.00	99.91	M140267	JW,JTG,JB
1305	69.65	15.64	2.22	0.00	0.03	1.26	4.66	3.67	0.00	0.18	0.02	0.09	0.00	97.42	M137106	GK
1305A	57.36	16.28	7.40	0.00	2.91	5.44	4.36	2.58	0.00	1.48	0.48	0.12	0.00	98.41	M137105	GK
1309	47.95	18.25	11.53	0.00	5.53	8.65	3.31	0.98	0.00	1.61	0.54	0.16	0.00	98.51	M137111	GK
1311	46.96	17.54	12.47	0.00	6.56	9.11	3.30	1.17	0.00	1.39	0.65	0.16	0.00	99.31	M136984	LE
1312	64.10	16.90	4.85	0.00	1.96	3.64	4.78	2.90	0.00	0.64	0.30	0.13	0.00	100.20	D235639	JW,JTG,JB
1315	55.46	15.60	7.64	0.00	5.63	6.98	3.65	2.11	0.00	0.57	0.37	0.11	0.00	98.12	M136983	LE
1316	51.02	18.24	9.94	0.00	4.33	7.82	3.72	1.24	0.00	1.38	0.55	0.16	0.00	98.40	M137112	GK
1317	51.90	17.20	10.10	0.00	3.36	7.52	4.56	2.21	0.55	2.15	0.81	0.16	0.00	100.52	D235648	JW,JTG,JB
1319	48.17	15.98	10.68	0.00	6.69	10.80	2.94	1.25	0.00	1.70	0.61	0.00	0.00	98.82	M131497	LE
1320	54.40	17.20	8.75	0.00	3.40	6.47	4.66	2.30	0.46	1.82	0.69	0.15	0.00	100.30	D235647	JW,JTG,JB
1321	44.42	14.02	11.05	0.00	9.17	12.92	2.93	1.31	0.00	2.11	0.66	0.18	0.00	98.77	M137114	GK
1328	50.16	12.98	10.33	0.00	8.27	8.40	3.27	1.79	0.00	1.91	0.44	0.15	0.00	97.70	M137113	GK
1330	47.88	13.94	10.21	0.00	9.54	10.17	3.12	1.39	0.00	1.94	0.44	0.16	0.00	98.79	M137116	GK
1330A	46.53	15.39	11.31	0.00	9.00	11.11	2.65	0.98	0.00	1.95	0.33	0.18	0.00	99.43	M137117	GK
1331	51.47	15.02	10.03	0.00	7.53	8.15	3.13	1.48	0.00	1.42	0.21	0.15	0.00	98.59	M137119	GK
1331A	47.03	13.53	9.93	0.00	12.05	10.24	2.71	0.77	0.00	1.28	0.41	0.16	0.00	98.11	M137118	GK
1331B	43.63	11.85	11.27	0.00	13.84	11.39	2.48	0.47	0.00	1.91	0.49	0.18	0.00	97.51	M137121	GK
1331C	47.63	16.10	11.24	0.00	7.89	10.95	2.93	1.04	0.00	1.96	0.42	0.17	0.00	100.33	M138254	JC
1332	53.20	15.25	10.01	0.00	6.89	7.81	2.99	1.54	0.00	1.42	0.26	0.15	0.00	99.52	M138253	JC
1334	46.72	15.79	11.69	0.00	8.79	9.94	2.63	0.62	0.00	1.87	0.28	0.18	0.00	98.51	M137115	GK
1418	55.50	18.10	8.88	0.00	2.74	6.34	4.26	1.51	0.47	1.30	0.57	0.16	0.00	99.83	M140266	JW,JTG,JB
1419	54.21	18.10	8.48	0.00	4.20	6.70	3.89	1.80	0.00	1.53	0.39	0.14	0.00	99.44	M136980	LE
1419A	50.85	15.99	9.15	0.00	6.86	8.87	3.42	1.68	0.00	1.62	0.47	0.16	0.00	99.07	M136981	LE
1419B	54.70	18.03	8.32	0.00	3.53	6.53	4.03	1.92	0.00	0.92	0.39	0.13	0.00	98.55	M136985	LE
1419C	53.60	17.70	8.80	0.00	4.26	7.81	3.80	1.76	0.65	1.67	0.45	0.14	0.00	100.64	D235638	JW,JTG,JB
1430	48.84	17.09	10.81	0.00	7.08	9.41	3.06	1.12	0.00	1.16	0.32	0.15	0.00	99.04	M136986	LE
2101	46.43	18.03	11.40	0.00	6.66	11.36	2.75	0.74	0.00	1.41	0.59	0.17	0.00	99.54	M137044	LE
2102	47.36	16.86	11.31	0.00	6.76	11.02	3.17	1.29	0.00	1.53	0.78	0.18	0.00	100.26	M138317	LE

TABLE 2. COMPLETE ANALYSES OF OXIDES IN WEIGHT PERCENT, SOUTHWEST MAP AREA--Continued

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO[1]	MgO	CaO	Na_2O[2]	K_2O[2]	H_2O[3]	TiO_2	P_2O_5[2]	MnO[3]	CO_2[3]	Total	Lab. No.	Analysts[4]
2104	49.28	16.93	11.11	0.00	6.38	8.87	3.59	1.20	0.00	1.96	0.53	0.17	0.00	100.02	M138328	LE
2105	46.93	17.50	11.55	0.00	6.92	10.70	2.93	1.02	0.00	2.03	0.52	0.17	0.00	100.27	M138324	LE
2105A	46.82	16.60	11.07	0.00	7.92	11.30	2.78	1.01	0.00	1.84	0.48	0.18	0.00	100.00	M138325	LE
2105B	46.83	18.02	10.87	0.00	6.77	11.21	2.91	1.04	0.00	1.89	0.56	0.18	0.00	100.28	M138326	LE
2105C	49.34	17.62	12.00	0.00	4.98	8.21	3.67	1.26	0.00	2.38	0.43	0.17	0.00	100.06	M138327	LE
2107	44.12	12.77	10.85	0.00	10.89	13.52	2.77	1.13	0.00	1.86	0.89	0.19	0.00	98.99	M138347	LE
2108	46.62	17.67	11.86	0.00	6.54	11.21	2.81	0.96	0.00	1.83	0.65	0.17	0.00	100.32	M138346	LE
2109	46.33	17.90	11.99	0.00	6.71	11.35	2.51	0.86	0.00	1.84	0.62	0.18	0.00	100.29	M138323	LE
2109A	49.44	16.21	10.89	0.00	6.25	9.35	3.51	1.12	0.00	2.06	0.51	0.16	0.00	99.50	M138322	LE
2110	46.36	13.33	10.39	0.00	10.82	12.78	2.11	0.94	0.00	1.59	0.54	0.16	0.00	99.02	M138320	LE
2110A	45.60	15.69	11.39	0.00	7.61	11.89	3.16	0.82	0.00	1.80	0.75	0.17	0.00	98.88	M138321	LE
2111	51.18	15.44	9.37	0.00	7.39	10.06	2.97	1.46	0.00	1.23	0.60	0.15	0.00	99.85	M138319	LE
2112	50.49	17.56	11.74	0.00	3.95	6.76	4.47	1.58	0.00	2.35	0.85	0.18	0.00	99.93	M137000	LE
2113	46.36	15.04	11.47	0.00	7.83	11.98	2.70	1.61	0.00	1.90	0.33	0.17	0.00	99.39	M136947	LE
2113A	49.50	14.46	11.17	0.00	11.32	8.10	2.87	0.95	0.00	1.58	0.23	0.15	0.00	100.33	M136954	LE
2114	46.38	18.16	11.08	0.00	7.19	11.09	2.82	0.81	0.00	1.72	0.41	0.18	0.00	99.84	M137001	LE
2114A	52.32	18.32	9.75	0.00	4.60	7.69	3.57	1.41	0.00	1.72	0.36	0.14	0.00	99.88	M138316	LE
2119	52.59	17.38	9.93	0.00	4.07	7.61	3.75	1.74	0.00	1.82	0.54	0.14	0.00	99.57	M138315	LE
2121	45.42	14.44	11.81	0.00	10.32	11.86	2.31	0.88	0.00	1.90	0.55	0.18	0.00	99.67	M138313	LE
2122	43.37	13.14	10.90	0.00	11.25	14.89	2.66	0.81	0.00	1.56	1.05	0.20	0.00	99.83	M136951	LE
2124	46.71	17.20	11.13	0.00	6.26	11.18	2.85	0.82	0.00	1.38	0.67	0.17	0.00	98.37	M136937	LE
2124A	47.18	15.95	10.94	0.00	8.97	12.06	2.52	0.70	0.00	1.30	0.55	0.18	0.00	100.35	M136939	LE
2124B	46.64	17.60	11.49	0.00	7.30	11.52	2.66	0.72	0.00	1.45	0.65	0.19	0.00	100.22	M136940	LE
2124C	47.18	17.62	11.34	0.00	6.64	11.14	2.83	0.82	0.00	1.41	0.72	0.18	0.00	99.88	M136944	LE
2124D	47.24	17.62	11.22	0.00	6.66	11.17	3.05	0.73	0.00	1.40	0.73	0.18	0.00	100.00	M136945	LE
2124E	51.20	14.91	9.24	0.00	7.94	10.08	2.67	1.31	0.00	1.10	0.45	0.15	0.00	99.05	M136946	LE
2124F	46.80	14.78	10.59	0.00	9.64	12.74	2.23	0.60	0.00	1.23	0.56	0.17	0.00	99.34	M136999	LE
2125	43.63	13.30	10.77	0.00	11.47	14.70	2.23	1.09	0.00	1.49	0.91	0.20	0.00	99.79	M136941	LE
2126	49.31	18.01	10.50	0.00	4.84	8.25	3.78	1.55	0.00	2.24	0.44	0.15	0.00	99.07	M136942	LE
2126A	43.80	15.16	11.78	0.00	10.20	12.08	2.04	0.93	0.00	2.01	0.63	0.19	0.00	98.82	M136943	LE
2127	50.20	17.99	10.59	0.00	4.70	8.05	3.64	1.53	0.00	2.14	0.43	0.15	0.00	99.42	M138314	LE
2128	47.57	14.18	10.40	0.00	9.08	12.13	2.65	0.92	0.00	1.50	0.39	0.17	0.00	98.99	M138285	LE
2131	46.53	15.52	10.38	0.00	5.68	12.90	3.32	1.27	0.00	1.84	0.51	0.16	0.00	98.11	M138234	SK
2132	48.56	16.95	11.39	0.00	5.56	9.22	3.32	1.45	0.00	2.34	0.53	0.15	0.00	99.47	M138232	SK

2132A	50.82	13.69	10.21	0.00	10.79	7.81	2.77	1.66	0.00	1.39	0.40	0.15	0.00	99.69	M138233	SK
2133	49.82	17.54	10.26	0.00	4.21	8.65	3.77	1.57	0.00	2.02	0.44	0.14	0.00	98.42	M138229	SK
2134	45.69	13.74	11.83	0.00	9.05	11.63	2.62	1.45	0.00	2.31	0.56	0.18	0.00	99.06	M138228	SK
2135	53.95	15.23	8.35	0.00	5.94	8.81	3.41	2.04	0.00	1.21	0.49	0.14	0.00	99.57	M139278	GK
2135A	45.02	13.25	10.93	0.00	11.09	14.29	2.33	1.02	0.00	1.42	0.85	0.19	0.00	100.39	M138226	SK
2135B	45.06	16.94	13.13	0.00	6.85	10.84	2.99	1.11	0.00	2.54	0.71	0.19	0.00	100.36	M138227	SK
2136	43.82	12.99	11.19	0.00	11.18	14.65	2.37	0.52	0.00	1.45	0.88	0.00	0.00	99.05	M131509	LE
2136A	56.99	15.16	1.88	4.66	4.40	7.08	3.70	2.58	0.75	1.03	0.40	0.13	0.07	98.83	M131386	MV,SN
2201	50.46	17.09	11.21	0.00	5.77	6.91	4.56	2.10	0.00	2.06	0.66	0.00	0.00	100.82	M133155	LE
2203	48.70	15.90	3.30	7.20	7.00	8.50	4.00	1.90	0.00	2.10	0.00	0.00	0.00	98.60	297-63	JAL
2204	49.80	15.50	2.60	8.10	7.10	8.60	4.20	1.90	0.00	2.30	0.00	0.00	0.00	100.10	SP135	JAL
2207	50.97	17.36	11.31	0.00	3.73	6.76	4.29	1.65	0.00	2.20	0.86	0.18	0.00	99.31	M136935	LE
2209	50.80	17.58	11.59	0.00	4.37	6.94	4.64	1.51	0.00	2.24	0.72	0.00	0.00	100.39	M133148	LE
2209A	50.72	17.58	11.55	0.00	4.44	6.96	4.45	1.53	0.00	2.20	0.76	0.17	0.00	100.36	M136932	LE
2212	47.40	16.74	11.62	0.00	5.91	7.21	3.86	2.14	0.00	2.21	0.80	0.16	0.00	98.05	M137003	LE
2213	45.93	15.54	11.40	0.00	9.54	9.36	3.51	1.50	0.00	1.99	0.84	0.17	0.00	99.78	M137038	LE
2217	50.30	17.45	11.63	0.00	3.70	6.88	4.39	1.57	0.00	2.29	0.82	0.18	0.00	99.21	M136933	LE
2217A	56.06	16.38	7.89	0.00	4.01	6.45	3.70	2.23	0.00	1.59	0.32	0.13	0.00	98.76	M136934	LE
2217B	47.88	12.64	10.79	0.00	13.81	9.83	2.29	0.75	0.00	1.17	0.22	0.17	0.00	99.55	M136997	LE
2218	57.58	14.57	7.02	0.00	4.12	6.45	3.66	2.61	0.00	1.35	0.40	0.12	0.00	97.88	M136936	LE
2219	49.45	13.36	9.81	0.00	12.95	8.98	2.48	1.15	0.00	1.22	0.29	0.16	0.00	99.85	M136938	LE
2220	46.16	16.02	10.92	0.00	9.33	12.53	2.60	0.89	0.00	1.77	0.36	0.18	0.00	100.76	M137052	LE
2221	59.99	16.53	3.02	2.74	2.08	6.15	4.36	2.01	1.07	1.26	0.17	0.09	0.59	100.06	M129288	HE,LE,JT
2222A	59.77	17.16	6.18	0.00	2.96	5.31	3.93	2.14	0.00	1.29	0.18	0.10	0.00	99.02	M136966	LE
2223	51.45	17.30	11.38	0.00	4.56	7.03	4.46	1.54	0.00	2.09	0.60	0.00	0.00	100.41	M133151	LE
2223A	49.68	17.09	10.85	0.00	4.91	6.17	4.29	2.39	0.00	2.09	0.77	0.15	0.00	98.39	M137004	LE
2226	48.79	17.52	12.06	0.00	5.06	7.87	4.33	1.24	0.00	2.24	0.50	0.00	0.00	99.61	M131488	LE
2230	46.23	16.41	11.21	0.00	7.41	11.61	2.91	1.21	0.00	1.78	0.81	0.17	0.00	99.75	M136998	LE
2232	50.04	17.37	10.52	0.00	4.77	8.81	4.17	1.79	0.00	1.98	0.59	0.00	0.00	100.04	M131487	LE
2233	61.54	16.71	2.39	2.91	2.06	4.99	3.91	2.43	1.40	0.98	0.16	0.09	0.31	99.88	M129285	HE,LE,JT
2233A	46.90	17.41	11.08	0.00	7.22	11.66	3.68	0.53	0.00	1.72	0.44	0.00	0.00	100.64	M131491	LE
2233B	65.08	16.44	4.35	0.00	1.43	3.51	4.20	2.94	0.00	0.71	0.14	0.09	0.00	98.89	M137090	LE
2234	51.40	15.86	9.98	0.00	5.77	7.44	3.80	1.91	0.00	2.00	0.43	0.00	0.00	98.59	M131490	LE
2235	55.10	17.80	3.73	3.40	3.57	6.74	3.86	1.66	1.93	1.46	0.18	0.11	0.55	100.09	M131381	SN
2302	48.91	16.59	4.40	6.20	6.20	7.10	4.57	2.18	0.52	2.25	0.73	0.15	0.15	99.95	M129330	HE,LE,JT
2304	48.94	18.24	10.86	0.00	5.40	8.53	3.68	0.97	0.00	1.62	0.66	0.17	0.00	99.07	M137043	LE
2307	54.06	17.94	9.44	0.00	3.72	6.67	4.57	1.68	0.00	1.52	0.57	0.00	0.00	100.17	M133153	LE
2307A	48.65	18.18	11.83	0.00	5.75	8.84	3.77	1.01	0.00	2.02	0.53	0.00	0.00	100.58	M133154	LE
2309	46.44	14.60	12.20	0.00	10.90	9.58	2.87	0.99	0.00	2.22	0.34	0.00	0.00	100.14	M133156	LE

TABLE 2. COMPLETE ANALYSES OF OXIDES IN WEIGHT PERCENT, SOUTHWEST MAP AREA--Continued

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO[1]	MgO	CaO	Na_2O[2]	K_2O[2]	H_2O[3]	TiO_2	P_2O_5[2]	MnO[3]	CO_2[3]	Total	Lab. No.	Analysts[4]
2309A	48.90	16.50	10.89	0.00	6.61	7.21	3.87	1.83	0.00	1.96	0.56	0.15	0.00	98.48	M137042	LE
2311	52.50	14.29	2.06	6.49	7.32	7.54	4.07	2.30	0.08	1.94	0.53	0.14	0.03	99.29	M129329	HE,LE,JT
2313	49.37	17.65	11.46	0.00	4.80	6.17	4.66	2.31	0.00	2.16	0.78	0.16	0.00	99.52	M137008	LE
2316	49.41	16.24	10.59	0.00	7.63	8.62	3.90	1.49	0.00	1.83	0.54	0.00	0.00	100.25	M133152	LE
2317	48.75	16.45	11.15	0.00	7.00	7.69	3.65	1.92	0.00	2.04	0.70	0.17	0.00	99.52	M138236	SK
2317A	48.44	16.88	11.03	0.00	7.11	7.53	3.34	1.85	0.00	2.07	0.70	0.16	0.00	99.11	M137041	LE
2318	48.26	16.88	11.99	0.00	6.33	6.90	4.40	2.03	0.00	2.22	0.75	0.00	0.00	99.76	M133150	LE
2319	52.09	17.13	8.82	0.00	6.76	8.39	3.65	1.37	0.00	1.29	0.35	0.00	0.00	99.85	M133149	LE
2322	49.79	18.41	11.37	0.00	5.83	8.28	3.64	1.22	0.00	1.93	0.41	0.16	0.00	101.04	M137051	LE
2323	49.65	18.29	11.57	0.00	4.63	8.09	3.58	0.93	0.00	1.85	0.50	0.17	0.00	99.26	M137040	LE
2325	48.40	19.83	11.93	0.00	4.87	8.07	3.66	0.81	0.00	1.87	0.51	0.19	0.00	100.14	M136975	LE
2332	50.30	16.93	10.55	0.00	5.31	6.27	3.78	2.41	0.00	1.89	0.68	0.15	0.00	98.27	M137107	GK
2332A	48.60	16.24	11.10	0.00	6.83	7.22	3.76	2.00	0.00	2.25	0.48	0.16	0.00	98.64	M137108	GK
2332B	57.40	17.70	7.67	0.00	2.65	5.37	4.60	2.13	1.00	1.25	0.56	0.14	0.00	100.47	D235643	JW,JTG,JB
2333	47.62	17.89	13.05	0.00	5.59	7.96	3.57	1.07	0.00	2.52	0.65	0.18	0.00	100.10	M136982	LE
2334	48.05	18.04	11.83	0.00	5.70	8.02	4.03	1.32	0.00	2.22	0.72	0.18	0.00	100.11	M136977	LE
2335	46.39	18.11	12.16	0.00	7.08	9.52	3.21	1.00	0.00	2.13	0.52	0.17	0.00	100.29	M136979	LE
2335A	47.30	18.26	12.95	0.00	6.07	8.57	3.67	0.87	0.00	2.39	0.56	0.17	0.00	100.81	M136976	LE
2430	48.55	17.08	11.82	0.00	6.48	6.88	4.13	2.08	0.00	2.27	0.70	0.16	0.00	100.15	M137039	LE
2Z03	45.89	14.57	11.52	0.00	9.38	11.84	2.28	0.88	0.00	1.96	0.45	0.17	0.00	98.94	M138344	LE
2Z03A	48.84	16.67	11.39	0.00	5.38	8.25	3.52	1.45	0.00	2.27	0.59	0.17	0.00	98.53	M138343	LE
2Z13	46.11	16.04	11.88	0.00	8.92	11.08	2.71	0.76	0.00	1.86	0.36	0.18	0.00	99.90	M138284	LE
2Z14	51.82	17.12	10.17	0.00	4.80	7.46	3.76	1.51	0.00	1.78	0.55	0.15	0.00	99.12	M138349	LE
2Z14A	52.08	17.35	10.21	0.00	4.78	7.50	3.79	1.52	0.00	1.79	0.54	0.15	0.00	99.71	M138350	LE
2Z15	45.50	15.49	11.69	0.00	9.45	10.95	2.62	0.75	0.00	1.75	0.34	0.18	0.00	98.72	M138348	LE
2Z15A	46.67	17.53	11.64	0.00	6.68	11.61	2.83	1.27	0.00	1.65	0.84	0.18	0.00	100.90	M138351	LE
2Z23	47.78	17.14	11.06	0.00	6.87	11.31	3.12	1.30	0.00	1.59	0.74	0.17	0.00	101.08	M138283	LE
2Z23A	47.90	17.59	11.89	0.00	5.27	8.75	3.56	1.24	0.00	2.10	0.71	0.18	0.00	99.19	M138288	LE
2Z24	45.79	17.09	11.37	0.00	6.41	11.80	3.04	1.28	0.00	1.61	0.84	0.18	0.00	99.41	M138291	LE
2Z25	47.41	16.83	11.39	0.00	7.69	9.72	3.16	1.06	0.00	1.76	0.57	0.18	0.00	99.77	M136949	LE
2Z25A	48.34	17.91	10.93	0.00	5.92	9.18	3.55	0.93	0.00	1.99	0.54	0.15	0.00	99.44	M136950	LE
2Z25B	49.02	17.63	11.67	0.00	5.19	8.56	3.71	1.06	0.00	2.08	0.78	0.16	0.00	99.86	M138286	LE
2Z25C	49.25	18.23	11.00	0.00	6.26	9.01	3.61	0.91	0.00	2.01	0.51	0.16	0.00	100.95	M138287	LE
2Z25D	46.97	13.81	11.09	0.00	9.90	10.72	2.59	1.02	0.00	1.81	0.40	0.17	0.00	98.48	M138292	LE

2Z26	46.09	13.36	12.55	0.00	9.79	10.47	2.83	1.16	0.00	2.43	0.60	0.18	0.00	99.46	M138293	LE
2Z27A	49.88	16.97	10.54	0.00	5.21	8.17	3.81	1.49	0.00	1.81	0.61	0.17	0.00	98.66	M138289	LE
2Z28	47.18	16.55	11.80	0.00	7.19	9.91	2.93	1.05	0.00	1.93	0.57	0.18	0.00	99.29	M138290	LE
3113	47.31	16.12	10.65	0.00	8.87	10.68	2.76	1.01	0.00	1.45	0.41	0.16	0.00	99.42	M137002	LE
3117	46.49	15.09	10.77	0.00	9.30	12.05	2.39	0.72	0.00	1.51	0.48	0.17	0.00	98.97	M138339	LE
3120	44.49	14.26	10.65	0.00	9.55	14.49	2.29	0.86	0.00	1.31	0.78	0.18	0.00	98.86	M138340	LE
3121	44.92	15.63	11.43	0.00	8.24	13.10	2.42	0.91	0.00	1.66	0.65	0.18	0.00	99.14	M138334	LE
3121A	47.65	12.16	9.94	0.00	13.66	9.57	2.27	1.03	0.00	1.03	0.53	0.17	0.00	98.01	M138335	LE
3121B	48.92	18.35	11.16	0.00	5.60	9.63	3.45	1.13	0.00	1.79	0.70	0.16	0.00	100.89	M138336	LE
3126	47.21	12.87	9.82	0.00	11.06	12.74	2.32	0.79	0.00	1.15	0.51	0.16	0.00	98.63	M138333	LE
3134	45.72	17.27	11.26	0.00	6.72	12.69	2.62	0.65	0.00	1.33	0.64	0.17	0.00	99.07	M138318	LE
3134A	48.58	17.42	12.55	0.00	4.94	7.84	3.46	1.33	0.00	2.69	0.59	0.16	0.00	99.56	M138329	LE
3134B	46.57	15.38	12.13	0.00	8.23	8.83	3.14	1.24	0.00	2.45	0.56	0.17	0.00	98.70	M138330	LE
3135	47.01	17.35	11.94	0.00	6.10	10.21	2.95	0.93	0.00	1.93	3.91	0.70	0.00	103.03	M136952	LE
3135A	46.41	17.56	11.76	0.00	6.93	10.61	2.75	0.83	0.00	1.85	0.36	0.18	0.00	99.24	M136953	LE
3136	45.30	17.01	11.49	0.00	7.57	12.88	2.55	0.55	0.00	1.22	0.65	0.18	0.00	99.40	M136948	LE
3201	50.27	18.28	11.28	0.00	5.30	8.16	3.78	1.23	0.00	1.83	0.39	0.17	0.00	100.69	M137048	LE
3211	46.58	14.51	10.57	0.00	9.69	10.92	2.87	0.89	0.00	1.51	0.57	0.17	0.00	98.28	M137005	LE
3212	47.20	17.57	11.76	0.00	7.63	10.06	3.24	0.77	0.00	1.80	0.38	0.00	0.00	100.41	M133168	LE
3212A	47.76	15.61	11.49	0.00	8.01	9.29	3.12	1.16	0.00	2.06	0.47	0.17	0.00	99.14	M138237	SK
3214	46.90	15.92	11.42	0.00	8.38	9.25	2.87	1.11	0.00	2.05	0.38	0.17	0.00	98.45	M137047	LE
3215	47.50	15.02	11.09	0.00	10.42	8.27	2.83	1.18	0.00	1.83	0.48	0.16	0.00	98.78	M138239	SK
3218	45.62	16.85	12.06	0.00	5.94	9.98	3.02	1.24	0.00	2.44	0.56	0.17	0.00	97.88	M136967	LE
3221	48.84	16.20	10.09	0.00	7.86	9.68	3.10	1.15	0.00	1.43	0.39	0.15	0.00	98.89	M136961	LE
3222	47.00	14.07	10.67	0.00	11.55	10.72	2.73	0.49	0.00	1.35	0.41	0.00	0.00	98.99	M133167	LE
3223	47.68	17.30	13.62	0.00	5.27	7.63	4.05	1.20	0.00	3.14	0.60	0.00	0.00	100.49	M133166	LE
3226	46.68	15.17	2.56	7.86	9.76	9.56	3.29	1.12	0.42	1.74	0.56	0.17	0.11	99.00	M126441	HE,LE,MC,GA,JT
3226A	48.34	17.32	2.28	4.64	10.54	14.18	1.86	0.07	0.07	0.67	0.00	0.12	0.04	100.13	M126442	HE,LE,MC,GA,JT
3226B	49.10	13.26	2.43	7.75	12.15	11.61	2.12	0.11	0.07	0.93	0.03	0.16	0.03	99.75	M126443	HE,LE,MC,GA,JT
3226C	40.21	0.37	0.00	2.51	46.04	0.14	0.00	0.01	0.00	0.05	0.03	0.15	0.02	99.53	M126444	HE,LE,MC,GA,JT
3226D	45.35	4.71	1.59	6.82	25.86	12.32	0.71	0.02	0.07	0.62	0.01	0.15	0.03	98.26	M126445	HE,LE,MC,GA,JT
3226E	48.55	3.35	1.21	4.53	21.77	18.08	0.53	0.01	0.00	0.26	0.00	0.13	0.03	98.45	M126446	HE,LE,MC,GA,JT
3226F	47.21	3.99	1.46	6.36	22.99	14.72	0.78	0.03	0.14	0.43	0.04	0.16	0.03	98.32	M126447	HE,LE,MC,GA,JT
3226G	44.51	6.84	2.65	9.39	21.01	12.11	0.82	0.02	0.11	1.17	0.01	0.17	0.03	98.84	M126448	HE,LE,MC,GA,JT
3226H	46.68	6.80	2.46	6.90	19.13	14.92	1.01	0.09	0.14	0.91	0.00	0.17	0.02	99.23	M126449	HE,LE,MC,GA,JT
3226J	47.40	14.30	3.30	7.50	9.70	9.40	3.40	1.30	0.00	2.00	0.00	0.00	0.00	98.30	C387-2	JAL
3226K	39.18	0.20	0.61	3.14	45.05	0.16	0.00	0.00	0.24	0.06	0.03	0.15	0.12	98.94	M131435	MV,BK,PK
3226L	45.77	7.82	3.09	7.31	20.21	12.91	0.84	0.00	0.10	0.93	0.00	0.17	0.05	99.20	M131436	MV,BK,PK
3226M	48.95	5.29	2.35	4.40	17.70	19.54	0.89	0.00	0.14	0.50	0.00	0.16	0.05	99.97	M131437	MV,BK,PK

TABLE 2. COMPLETE ANALYSES OF OXIDES IN WEIGHT PERCENT, SOUTHWEST MAP AREA--Continued

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO[1]	MgO	CaO	Na_2O[2]	K_2O[2]	H_2O[3]	TiO_2	P_2O_5[2]	MnO[3]	CO_2[3]	Total	Lab. No.	Analysts[4]
32260	51.67	17.90	10.20	0.00	5.14	7.72	3.83	1.32	0.00	1.31	0.43	0.00	0.00	99.52	M133165	LE
3226P	45.80	13.68	11.60	0.00	11.60	10.35	3.14	0.95	0.00	1.80	0.59	0.00	0.00	99.51	M133164	LE
3228	46.48	14.74	11.27	0.00	11.50	9.74	2.95	1.01	0.00	1.79	0.53	0.17	0.00	100.18	M136959	LE
3228A	48.88	18.26	10.70	0.00	6.00	8.94	3.31	1.29	0.00	1.66	0.49	0.15	0.00	99.68	M136968	LE
3235	45.63	14.14	11.55	0.00	10.87	11.62	3.00	0.85	0.00	1.73	0.76	0.00	0.00	100.15	M133161	LE
3236	47.52	16.07	11.35	0.00	8.59	9.55	3.52	1.29	0.00	1.95	0.78	0.00	0.00	100.62	M133157	LE
3236A	51.72	16.99	10.95	0.00	5.07	6.20	4.96	2.29	0.00	2.03	0.62	0.00	0.00	100.83	M133158	LE
3236B	46.97	15.61	11.48	0.00	8.84	9.91	3.18	1.27	0.00	1.95	0.72	0.00	0.00	99.93	M133160	LE
3236C	49.47	17.12	11.11	0.00	5.38	6.21	4.40	2.46	0.00	2.15	0.65	0.16	0.00	99.11	M137045	LE
3301	48.45	17.46	12.63	0.00	5.24	7.72	4.02	1.26	0.00	2.85	0.65	0.18	0.00	100.46	M137070	LE
3304	48.55	16.37	11.60	0.00	7.23	7.82	3.86	1.89	0.00	2.09	0.70	0.17	0.00	100.28	M138241	SK
3305	49.14	17.28	11.86	0.00	5.45	8.44	3.78	1.19	0.00	2.35	0.55	0.00	0.00	100.04	M133174	LE
3305A	49.07	18.94	11.11	0.00	5.48	8.33	3.92	1.13	0.00	2.03	0.41	0.16	0.00	100.58	M137007	LE
3305B	47.51	15.86	11.69	0.00	8.21	8.03	3.69	1.66	0.00	2.35	0.57	0.17	0.00	99.74	M137069	LE
3307	50.32	17.81	11.12	0.00	5.45	8.46	3.86	1.18	0.00	1.79	0.47	0.00	0.00	100.46	M133169	LE
3311	49.47	17.33	10.45	0.00	7.65	10.34	2.79	0.85	0.00	1.41	0.37	0.16	0.00	100.82	M137071	LE
3313	53.70	16.90	10.80	0.00	3.61	5.77	4.75	1.99	0.09	2.14	0.69	0.15	0.00	100.59	D235640	JW,JTG,JB
3319	46.24	15.47	12.75	0.00	9.66	9.09	3.36	1.09	0.00	2.31	0.50	0.00	0.00	100.47	M133170	LE
3323	48.23	15.28	2.11	8.06	8.78	8.67	3.97	1.64	0.27	2.16	0.65	0.16	0.03	100.01	M129334	HE,LE,JT
3324	47.66	15.87	10.86	0.00	8.76	8.32	3.74	1.66	0.00	2.10	0.68	0.17	0.00	99.82	M137053	LE
3325	51.62	15.43	1.94	7.62	7.97	8.27	3.59	1.18	0.34	1.32	0.28	0.15	0.03	99.74	M129331	HE,LE,JT
3326	48.64	17.16	11.51	0.00	8.01	11.01	2.13	0.44	0.00	1.29	0.31	0.17	0.00	100.67	M137054	LE
3327	47.97	15.72	2.39	8.66	7.67	8.14	3.95	1.77	0.26	2.45	0.66	0.17	0.05	99.86	M129332	HE,LE,JT
3331	50.65	17.28	11.17	0.00	5.24	6.45	4.57	2.28	0.00	2.08	0.64	0.00	0.00	100.36	M133159	LE
3333	50.55	16.73	11.24	0.00	5.71	6.57	4.75	2.41	0.00	2.07	0.69	0.00	0.00	100.72	M133162	LE
3333A	75.23	12.99	1.06	0.00	0.01	0.41	4.73	4.43	0.00	0.09	0.02	0.00	0.00	98.97	M133163	LE
3335	72.47	13.83	0.65	0.53	0.24	1.03	4.67	4.06	2.08	0.07	0.03	0.06	0.02	99.74	M129328	HE,LE,JT
3406	49.21	13.27	10.48	0.00	10.54	10.14	2.77	1.19	0.00	1.29	0.53	0.00	0.00	99.42	M133171	LE
3407	53.30	16.53	3.81	5.90	3.68	5.83	4.78	1.91	0.66	2.02	0.62	0.14	0.31	99.49	M133186	LE,MC
3407A	48.81	16.06	3.07	7.66	8.12	8.65	3.59	1.07	0.28	1.69	0.43	0.17	0.07	99.67	M133187	LE,MC
3407B	83.66	7.13	1.66	1.12	0.67	0.99	1.16	1.32	1.11	0.43	0.08	0.05	0.02	99.40	M133188	LE,MC
3430	74.17	14.03	1.00	0.25	0.21	1.11	4.80	3.92	0.38	0.08	0.04	0.04	0.05	100.08	M129342	HE,LE,JT
3Z13	49.51	16.35	10.98	0.00	7.86	7.95	3.59	1.61	0.00	2.13	0.57	0.16	0.00	100.71	M138338	LE
3Z13A	45.55	15.54	11.20	0.00	8.24	13.13	2.83	1.08	0.00	1.52	0.87	0.18	0.00	100.14	M138337	LE

3Z22	45.65	13.74	11.05	0.00	9.55	13.59	2.10	0.86	0.00	1.57	0.48	0.17	0.00	98.76	M138342	LE
3Z26	48.14	17.03	11.65	0.00	5.71	8.61	3.51	1.37	0.00	2.37	0.58	0.18	0.00	99.15	M138341	LE
3Z33	51.77	16.23	9.97	0.00	5.79	8.10	3.54	1.74	0.00	1.83	0.45	0.15	0.00	99.57	M138345	LE
3Z36	52.24	17.30	10.75	0.00	4.36	7.14	4.36	1.60	0.00	1.93	0.74	0.17	0.00	100.59	M138331	LE
3Z36A	49.57	17.59	10.79	0.00	5.21	8.51	3.63	1.50	0.00	2.02	0.43	0.15	0.00	99.40	M138332	LE
4213	55.90	16.60	2.90	5.58	3.10	5.40	4.80	2.40	0.40	1.80	0.42	0.15	0.05	99.50	3134	DE
4214	50.93	17.14	10.82	0.00	5.47	8.06	4.01	1.21	0.00	1.77	0.62	0.00	0.00	100.03	M133181	LE
4225	46.32	14.50	11.31	0.00	11.28	10.50	2.41	0.80	0.00	1.70	0.57	0.18	0.00	99.57	M137009	LE
4226	45.96	16.13	12.03	0.00	9.12	10.46	2.88	0.76	0.00	1.91	0.73	0.19	0.00	100.17	M137010	LE
4227	52.20	16.87	10.32	0.00	4.95	7.31	4.30	1.38	0.00	1.67	0.48	0.00	0.00	99.48	M133178	LE
4234	47.30	17.13	12.16	0.00	6.12	9.58	3.11	1.26	0.00	2.50	0.53	0.17	0.00	99.86	M138240	SK
4236	51.10	16.28	10.11	0.00	5.13	8.72	4.03	1.29	0.00	1.58	0.46	0.00	0.00	98.70	M133179	LE
4236A	50.03	17.79	10.03	0.00	6.58	9.24	3.36	0.81	0.00	1.14	0.49	0.00	0.00	99.47	M133180	LE
4301	59.04	13.40	5.80	0.00	5.09	7.73	3.49	3.06	0.00	0.84	0.59	0.00	0.00	99.04	M131445	LE
4302	49.40	17.51	10.25	0.00	6.21	8.90	3.69	1.12	0.00	1.70	0.43	0.16	0.00	99.37	M137057	LE
4302A	49.22	17.64	10.25	0.00	6.26	8.94	3.59	1.12	0.00	1.70	0.69	0.16	0.00	99.57	M137058	LE
4303	48.43	16.47	11.77	0.00	7.85	9.02	3.19	0.92	0.00	1.90	0.41	0.17	0.00	100.13	M137059	LE
4311	49.04	15.17	11.26	0.00	7.86	9.55	3.43	0.99	0.00	1.76	0.54	0.00	0.00	99.60	M133184	LE
4313	49.11	16.08	10.87	0.00	7.93	11.02	2.79	0.74	0.00	1.34	0.38	0.00	0.00	100.26	M131444	LE
4313A	48.13	15.75	10.84	0.00	8.39	10.89	2.71	0.70	0.00	1.34	0.32	0.16	0.00	99.23	M136958	LE
4314	59.31	13.63	5.81	0.00	4.39	7.11	3.55	3.19	0.00	0.96	0.58	0.00	0.00	98.53	M133183	LE
4315	45.80	16.07	11.60	0.00	8.75	12.75	2.38	0.66	0.00	1.30	0.82	0.18	0.00	100.31	M137061	LE
4316	46.99	17.08	11.41	0.00	7.40	12.12	2.89	0.54	0.00	1.48	0.40	0.00	0.00	100.31	M133173	LE
4319	47.62	16.20	11.64	0.00	7.51	9.57	3.45	1.02	0.00	2.13	0.53	0.00	0.00	99.67	M133176	LE
4321	52.93	15.78	8.87	0.00	7.15	8.00	3.42	1.46	0.00	1.29	0.34	0.14	0.00	99.38	M137063	LE
4322	45.60	15.48	12.32	0.00	9.30	10.95	2.85	1.27	0.00	2.24	0.56	0.20	0.00	100.77	M137065	LE
4323	49.39	17.61	10.55	0.00	6.95	10.02	3.07	0.88	0.00	1.42	0.58	0.16	0.00	100.63	M137056	LE
4323A	46.88	18.22	11.30	0.00	6.53	11.75	2.88	0.56	0.00	1.47	0.50	0.17	0.00	100.26	M137062	LE
4324	48.65	15.53	11.17	0.00	9.07	9.53	3.15	0.99	0.00	1.73	0.35	0.00	0.00	100.17	M131443	LE
4324A	49.77	14.02	9.94	0.00	11.50	8.84	2.64	1.06	0.00	1.19	0.31	0.14	0.00	99.41	M137064	LE
4325	49.99	17.55	10.75	0.00	6.18	9.84	2.87	0.78	0.00	1.36	0.42	0.16	0.00	99.90	M137068	LE
4326	45.23	15.16	12.10	0.00	9.29	11.23	2.72	1.20	0.00	2.21	0.54	0.19	0.00	99.87	M137067	LE
4326A	47.71	18.35	10.85	0.00	7.15	11.32	2.77	0.62	0.00	1.43	0.38	0.17	0.00	100.75	M137066	LE
4331	48.76	15.75	10.54	0.00	8.50	9.39	3.35	1.17	0.00	1.64	0.40	0.00	0.00	99.50	M133177	LE
4332	48.24	16.75	11.48	0.00	9.66	9.55	2.35	0.91	0.00	1.47	0.32	0.00	0.00	100.73	M133175	LE
4336	54.30	16.86	8.73	0.00	4.93	7.99	3.26	1.96	0.00	1.09	0.39	0.14	0.00	99.65	M137055	LE
4406	46.11	15.77	11.33	0.00	8.26	11.85	2.84	1.06	0.00	1.67	0.76	0.18	0.00	99.83	M136962	LE
4407A	47.20	15.81	11.32	0.00	8.72	11.40	2.59	0.91	0.00	1.79	0.45	0.18	0.00	100.37	M137060	LE
4418	58.23	17.95	7.16	0.00	2.81	5.71	4.23	1.91	0.00	1.31	0.25	0.11	0.00	99.67	M136960	LE

TABLE 2. COMPLETE ANALYSES OF OXIDES IN WEIGHT PERCENT, SOUTHWEST MAP AREA--Continued

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO[1]	MgO	CaO	Na_2O[2]	K_2O[2]	H_2O[3]	TiO_2	P_2O_5[2]	MnO[3]	CO_2[3]	Total	Lab. No.	Analysts[4]
4418A	54.65	16.74	8.79	0.00	5.29	7.21	3.53	1.80	0.00	1.59	0.31	0.14	0.00	100.05	M137011	LE
4430	48.27	17.80	11.89	0.00	6.12	8.34	3.49	1.21	0.00	2.35	0.36	0.16	0.00	99.99	M136955	LE
4431	59.25	14.73	7.00	0.00	4.62	6.75	3.36	2.82	0.00	1.02	0.42	0.00	0.00	99.97	M133172	LE

[1]0.00, total iron was determined by X-ray fluorescence and reported as Fe_2O_3.

[2]0.00, value below limit of detection.

[3]0.00, not determined.

[4]Analysts:

BK = Bi-Shia King
DE = D. J. Emmons
GA = Gil Ambats
GK = G. M. Kawakita
HE = H. Neil Elsheimer
HR = H. H. Robinson (1913)
JB = J. W. Baker
JC = J. F. Carr
JTG= J. E. Taggart, Jr.
JAL= Japan Analytical Laboratory (Stoeser, 1973)
JT = J. Tillman
JW = J. S. Wahlberg
LA = L. Artis
LE = L. Espos
MC = Marcelyn Cremer
MV = M. Villarreal
PK = Paul Klock
RM = R. J. Marsh (Robinson, 1913)
SK = S. Kramer
SN = Sarah Neil

TABLE 3. ADJUSTED ANALYSES OF MAJOR OXIDES IN WEIGHT PERCENT, SOUTHWEST MAP AREA

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O[1]	K_2O[1]	TiO_2	P_2O_5[1]	MnO[2]
0301	47.02	18.08	1.71	9.20	7.56	10.58	3.12	0.87	1.28	0.40	0.16
0305	47.73	15.06	1.61	8.55	11.25	10.26	2.72	0.85	1.48	0.30	0.16
1101	45.24	16.98	1.85	10.14	7.63	10.61	3.29	1.11	2.44	0.69	0.00
1101A	53.00	17.84	1.57	7.61	4.02	7.12	4.45	1.90	1.67	0.79	0.00
1101B	48.39	17.77	1.70	8.86	5.82	9.79	3.77	1.47	1.72	0.71	0.00
1102	45.87	16.97	1.83	9.98	7.15	10.58	3.13	1.16	2.44	0.70	0.19
1103	54.87	14.71	1.32	6.24	7.32	8.12	3.42	2.07	1.25	0.54	0.15
1104	48.22	16.92	1.78	9.37	7.19	8.45	3.64	1.27	2.46	0.54	0.17
1105	50.60	17.14	1.61	8.14	6.13	8.72	3.70	1.36	1.85	0.59	0.15
1110	49.56	18.01	1.72	9.08	5.34	8.67	3.51	1.32	1.86	0.75	0.18
1110A	56.06	15.49	1.31	6.02	5.08	8.33	3.66	2.16	1.23	0.54	0.14
1110B	49.19	18.09	1.75	8.99	5.69	9.29	2.91	1.40	1.77	0.72	0.18
1111	49.38	17.98	1.74	9.00	5.02	9.50	3.27	1.45	1.75	0.74	0.16
1122	60.68	17.61	1.27	5.31	1.04	3.82	5.90	2.44	1.06	0.71	0.13
1123	46.94	16.43	1.74	9.26	7.73	11.18	3.11	1.09	1.91	0.61	0.00
1123A	48.00	17.28	1.75	9.17	5.63	11.00	3.38	1.43	1.65	0.70	0.00
1135	46.67	16.17	1.65	9.00	7.58	11.89	3.12	1.23	1.66	0.84	0.19
1136	46.31	14.58	1.68	9.11	9.44	14.28	2.08	0.57	1.23	0.71	0.00
1136A	50.10	16.79	1.72	8.74	6.31	8.50	3.79	1.44	2.01	0.61	0.00
1201	46.17	17.72	1.60	8.73	6.87	12.52	2.41	1.29	1.83	0.67	0.18
1202	66.13	16.44	0.81	3.08	1.39	3.73	4.20	2.97	0.67	0.48	0.08
1203	66.89	15.40	0.85	3.16	1.90	3.84	3.96	3.08	0.69	0.16	0.08
1203A	66.89	15.81	0.84	3.03	1.36	3.37	4.38	3.37	0.68	0.18	0.08
1204	58.41	17.08	1.51	6.57	2.00	5.10	5.17	2.08	1.37	0.58	0.14
1206	62.17	17.50	1.12	4.52	1.91	4.49	4.33	2.54	0.95	0.34	0.11
1207	54.60	16.19	1.41	6.56	6.43	7.56	4.43	1.23	1.48	0.10	0.00
1208	66.10	16.02	0.91	3.36	1.64	3.62	4.19	3.08	0.78	0.20	0.09
1209	65.18	17.33	0.89	3.45	1.44	3.41	4.33	2.83	0.78	0.22	0.09
1209A	64.58	16.94	0.93	3.55	1.72	3.80	4.31	2.98	0.90	0.19	0.09
1209B	65.33	16.67	0.92	3.42	1.47	3.97	4.52	2.63	0.76	0.22	0.08
1209C	49.56	18.64	1.60	8.57	5.73	8.41	3.41	1.33	1.89	0.66	0.18
1212	46.49	18.39	1.57	8.55	7.07	11.19	3.05	1.09	1.89	0.52	0.17
1215	50.10	17.82	1.59	8.19	5.10	9.22	4.05	1.68	1.74	0.52	0.00

TABLE 3. ADJUSTED ANALYSES OF MAJOR OXIDES IN WEIGHT PERCENT, SOUTHWEST MAP AREA--Continued

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O[1]	K_2O[1]	TiO_2	P_2O_5[1]	MnO[2]
1215A	45.45	17.08	1.64	8.99	7.88	13.00	2.81	0.75	1.67	0.71	0.00
1215B	69.72	17.16	0.48	1.58	0.50	3.31	5.61	1.28	0.27	0.06	0.03
1215C	48.83	15.54	1.64	8.60	7.89	11.27	3.06	0.90	1.69	0.41	0.16
1215D	41.57	5.77	2.30	13.44	29.06	6.39	0.65	0.01	0.60	0.03	0.18
1215E	43.82	8.82	2.44	14.23	18.92	8.80	1.29	0.11	1.35	0.02	0.20
1215F	47.35	7.52	1.75	9.62	14.59	16.43	1.17	0.03	1.23	0.00	0.28
1215G	49.26	6.04	1.12	5.85	16.47	19.32	0.89	0.05	0.76	0.08	0.17
1216	46.25	14.48	1.69	9.44	9.35	13.41	2.41	0.47	1.59	0.71	0.20
1216A	44.74	14.93	1.60	8.82	10.46	13.28	2.79	1.08	1.45	0.86	0.00
1216B	45.38	13.82	1.64	9.04	9.41	15.73	2.08	0.44	1.53	0.70	0.22
1217	65.28	16.55	0.91	3.37	1.57	3.80	4.70	2.71	0.84	0.17	0.08
1217A	65.68	16.68	0.83	3.17	1.55	3.67	4.61	2.82	0.73	0.18	0.08
1217B	66.57	15.96	0.90	3.21	1.62	3.91	4.24	2.63	0.70	0.20	0.06
1217C	67.68	15.67	0.84	2.96	1.32	3.24	4.38	2.95	0.70	0.17	0.06
1218	66.26	16.20	0.87	3.11	1.48	3.58	4.75	2.91	0.68	0.15	0.00
1218B	66.35	15.93	0.86	3.13	1.54	3.83	4.45	2.89	0.75	0.17	0.08
1218C	56.31	12.57	1.46	6.59	6.98	7.75	3.39	2.77	1.64	0.41	0.13
1218D	71.41	13.96	0.70	2.22	0.85	2.03	4.08	4.05	0.48	0.12	0.08
1218E	71.62	14.06	0.65	2.04	0.74	1.94	4.00	4.33	0.42	0.12	0.08
1218F	48.86	17.01	1.69	8.84	6.47	10.43	3.40	0.99	1.74	0.40	0.17
1220	65.97	16.18	0.87	3.18	1.67	3.79	4.02	3.33	0.71	0.17	0.08
1221	67.35	15.60	0.82	2.93	1.55	3.44	4.44	2.94	0.68	0.15	0.08
1221A	43.34	2.68	2.12	12.29	31.57	6.71	0.52	0.05	0.50	0.02	0.19
1221B	52.53	18.71	1.62	7.80	4.68	7.68	3.90	1.18	1.61	0.28	0.00
1221C	48.88	16.81	1.66	8.48	7.02	10.79	3.27	1.09	1.57	0.43	0.00
1222	46.95	15.92	1.69	9.01	8.95	11.21	2.83	0.88	1.97	0.41	0.18
1223	53.16	18.47	1.68	8.21	2.91	6.12	4.87	1.78	1.98	0.67	0.15
1224	53.87	15.28	1.54	7.33	6.28	8.30	3.62	1.67	1.66	0.45	0.00
1224A	54.41	18.27	1.61	7.56	2.78	6.05	4.86	1.78	1.80	0.74	0.14
1226	50.62	16.76	1.43	7.15	6.46	10.16	3.64	1.68	1.64	0.46	0.00
1226A	50.13	17.35	1.77	8.88	6.22	8.41	3.92	1.04	1.82	0.45	0.00
1227	52.79	16.06	1.50	7.19	5.34	9.21	3.78	2.09	1.45	0.51	0.00
1227A	50.29	17.47	1.71	8.63	5.37	8.54	3.77	1.60	2.03	0.58	0.00

1227B	46.51	16.41	1.70	9.04	8.70	11.68	2.91	0.79	1.90	0.36	0.00
1229	52.54	18.80	1.57	7.49	4.88	7.86	3.84	1.19	1.55	0.28	0.00
1231	46.24	15.24	1.71	9.25	8.99	12.34	2.88	0.99	1.78	0.58	0.00
1231A	66.79	16.97	0.94	3.29	0.25	1.90	5.76	3.47	0.32	0.16	0.14
1231B	51.15	17.32	1.66	8.29	5.18	8.20	4.08	1.52	1.92	0.67	0.00
1231C	50.12	16.97	1.71	8.64	5.97	8.65	3.63	1.48	1.99	0.67	0.18
1232	57.27	16.59	1.41	6.32	3.87	5.78	4.37	2.53	1.32	0.36	0.16
1233	46.62	15.32	1.63	8.71	8.90	13.07	3.03	0.65	1.37	0.70	0.00
1234	45.62	15.89	1.63	8.92	9.13	12.69	3.00	0.98	1.45	0.69	0.00
1234A	46.29	12.98	1.61	8.84	14.32	10.62	2.49	0.78	1.31	0.56	0.18
1236	48.44	18.35	1.73	9.16	5.61	9.47	3.78	0.64	2.10	0.51	0.18
1301	44.93	12.64	1.65	9.16	12.95	12.81	2.55	0.42	1.93	0.76	0.19
1301A	59.26	18.20	1.22	5.21	1.94	5.06	4.95	2.31	0.97	0.73	0.15
1305	71.62	16.08	0.49	1.60	0.03	1.30	4.79	3.77	0.19	0.02	0.09
1305A	58.66	16.65	1.29	5.64	2.98	5.56	4.45	2.64	1.51	0.49	0.12
1309	49.17	18.72	1.73	9.07	5.67	8.87	3.39	1.01	1.65	0.54	0.16
1311	47.81	17.85	1.83	9.76	6.68	9.27	3.36	1.19	1.42	0.66	0.16
1312	64.22	16.93	0.94	3.52	1.96	3.65	4.79	2.91	0.64	0.30	0.13
1315	56.90	16.00	1.29	5.88	5.78	7.16	3.74	2.16	0.58	0.38	0.11
1316	52.30	18.70	1.57	7.75	4.44	8.02	3.81	1.27	1.41	0.56	0.16
1317	52.37	17.34	1.59	7.73	3.39	7.59	4.60	2.22	2.16	0.82	0.16
1319	49.20	16.32	1.60	8.37	6.83	11.03	3.00	1.28	1.74	0.61	0.00
1320	54.90	17.35	1.43	6.64	3.43	6.53	4.70	2.32	1.84	0.70	0.15
1321	45.41	14.33	1.57	8.74	9.38	13.21	3.00	1.34	2.16	0.67	0.18
1328	51.81	13.41	1.62	8.13	8.54	8.67	3.38	1.85	1.97	0.45	0.15
1330	48.90	14.24	1.53	8.00	9.74	10.39	3.19	1.42	1.98	0.45	0.16
1330A	47.26	15.63	1.66	8.84	9.14	11.28	2.69	1.00	1.98	0.34	0.18
1331	52.67	15.37	1.59	7.80	7.70	8.34	3.20	1.51	1.45	0.21	0.15
1331A	48.36	13.91	1.48	7.85	12.39	10.53	2.79	0.79	1.32	0.42	0.16
1331B	45.20	12.28	1.61	9.04	14.34	11.80	2.57	0.49	1.98	0.51	0.19
1331C	47.94	16.20	1.65	8.69	7.94	11.02	2.95	1.05	1.97	0.42	0.17
1332	53.92	15.46	1.62	7.66	6.98	7.92	3.03	1.56	1.44	0.26	0.15
1334	47.92	16.19	1.73	9.22	9.02	10.19	2.70	0.64	1.92	0.29	0.18
1418	56.28	18.35	1.49	6.75	2.78	6.43	4.32	1.53	1.32	0.58	0.16
1419	54.92	18.33	1.39	6.46	4.25	6.79	3.94	1.82	1.55	0.40	0.14
1419A	51.74	16.27	1.42	7.08	6.98	9.03	3.48	1.71	1.65	0.48	0.13
1419B	55.91	18.48	1.39	6.39	3.61	6.67	4.12	1.96	0.94	0.40	0.13
1419C	54.01	17.83	1.42	6.69	4.29	7.87	3.83	1.77	1.68	0.45	0.14
1430	49.78	17.42	1.64	8.42	7.22	9.59	3.12	1.14	1.18	0.33	0.15

TABLE 3. ADJUSTED ANALYSES OF MAJOR OXIDES IN WEIGHT PERCENT, SOUTHWEST MAP AREA--Continued

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O[1]	K_2O[1]	TiO_2	P_2O_5[1]	MnO[2]
2101	47.11	18.29	1.66	8.91	6.76	11.53	2.79	0.75	1.43	0.60	0.17
2102	47.70	16.98	1.66	8.75	6.81	11.10	3.19	1.30	1.54	0.79	0.18
2104	49.75	17.08	1.68	8.57	6.44	8.95	3.62	1.20	1.98	0.54	0.17
2105	47.28	17.63	1.68	8.95	6.97	10.78	2.95	1.03	2.04	0.52	0.17
2105A	47.27	16.76	1.62	8.59	8.00	11.41	2.81	1.02	1.86	0.48	0.18
2105B	47.14	18.14	1.58	8.41	6.81	11.28	2.93	1.05	1.90	0.56	0.18
2105C	49.82	17.79	1.82	9.26	5.02	8.29	3.71	1.27	2.40	0.43	0.17
2107	45.00	13.02	1.54	8.57	11.11	13.79	2.83	1.15	1.90	0.91	0.19
2108	46.95	17.79	1.72	9.19	6.59	11.29	2.83	0.97	1.84	0.65	0.17
2109	46.68	18.04	1.73	9.29	6.76	11.44	2.53	0.87	1.85	0.61	0.18
2109A	50.16	16.45	1.66	8.44	6.34	9.49	3.56	1.14	2.09	0.52	0.16
2110	47.25	13.59	1.52	8.15	11.03	13.02	2.15	0.96	1.62	0.54	0.16
2110A	46.58	16.03	1.64	8.98	7.77	12.15	3.23	0.84	1.84	0.77	0.17
2111	51.67	15.59	1.46	7.19	7.46	10.16	3.00	1.47	1.23	0.61	0.15
2112	51.04	17.75	1.81	9.04	3.99	6.83	4.52	1.60	2.38	0.86	0.18
2113	47.12	15.29	1.67	8.97	7.96	12.18	2.74	1.64	1.93	0.34	0.17
2113A	49.81	14.55	1.69	8.58	11.39	8.15	2.89	0.96	1.59	0.23	0.15
2114	46.91	18.36	1.61	8.63	7.27	11.22	2.85	0.82	1.74	0.41	0.18
2114A	52.82	18.50	1.54	7.46	4.64	7.76	3.60	1.42	1.74	0.36	0.14
2119	53.27	17.59	1.59	7.62	4.12	7.71	3.80	1.76	1.84	0.54	0.14
2121	46.05	14.64	1.69	9.24	10.46	12.02	2.34	0.89	1.93	0.56	0.18
2122	43.86	13.29	1.52	8.54	11.38	15.06	2.69	0.82	1.58	1.06	0.20
2124	47.96	17.66	1.64	8.79	6.43	11.48	2.93	0.84	1.42	0.69	0.17
2124A	47.46	16.04	1.60	8.46	9.02	12.13	2.53	0.70	1.31	0.54	0.18
2124B	47.01	17.74	1.66	8.91	7.36	11.61	2.68	0.73	1.46	0.66	0.19
2124C	47.70	17.82	1.67	8.80	6.71	11.26	2.86	0.83	1.43	0.73	0.18
2124D	47.70	17.79	1.65	8.70	6.73	11.28	3.08	0.74	1.41	0.74	0.18
2124E	52.11	15.17	1.46	7.14	8.08	10.26	2.72	1.33	1.12	0.46	0.15
2124F	47.55	15.02	1.55	8.27	9.79	12.94	2.27	0.61	1.25	0.57	0.17
2125	44.14	13.45	1.50	8.45	11.60	14.87	2.26	1.09	1.51	0.92	0.20
2126	50.23	18.34	1.60	8.16	4.93	8.40	3.85	1.58	2.28	0.45	0.15
2126A	44.79	15.50	1.67	9.34	10.43	12.35	2.09	0.95	2.06	0.64	0.19
2127	50.96	18.26	1.63	8.19	4.77	8.16	3.70	1.55	2.16	0.44	0.15

2128	48.50	14.46	1.55	8.14	9.26	12.37	2.70	0.94	1.53	0.40	0.17
2131	47.87	15.97	1.53	8.22	5.84	13.27	3.42	1.31	1.89	0.52	0.16
2132	49.30	17.21	1.72	8.85	5.65	9.36	3.37	1.47	2.38	0.54	0.15
2132A	51.43	13.85	1.59	7.86	10.92	7.90	2.80	1.68	1.41	0.40	0.15
2133	51.08	17.98	1.59	8.03	4.32	8.87	3.87	1.61	2.07	0.45	0.14
2134	46.61	14.02	1.71	9.29	9.23	11.86	2.67	1.48	2.36	0.57	0.18
2135	54.57	15.41	1.37	6.36	6.01	8.91	3.45	2.06	1.22	0.50	0.14
2135A	45.27	13.32	1.55	8.49	11.15	14.37	2.34	1.03	1.43	0.85	0.19
2135B	45.41	17.07	1.86	10.22	6.90	10.93	3.01	1.12	2.56	0.72	0.19
2136	44.68	13.24	1.58	8.84	11.40	14.94	2.41	0.53	1.48	0.90	0.00
2136A	58.25	15.49	1.23	5.38	4.50	7.15	3.78	2.64	1.05	0.41	0.13
2201	50.53	17.10	1.71	8.54	5.78	6.92	4.57	2.10	2.06	0.66	0.00
2203	49.48	16.15	1.71	8.79	7.11	8.64	4.06	1.93	2.13	0.00	0.00
2204	49.80	15.50	1.75	8.85	7.10	8.60	4.20	1.90	2.30	0.00	0.00
2207	51.83	17.65	1.77	8.75	3.79	6.87	4.36	1.68	2.24	0.87	0.18
2209	51.11	17.69	1.79	8.87	4.39	6.98	4.67	1.52	2.25	0.72	0.00
2209A	51.04	17.69	1.78	8.85	4.47	7.00	4.48	1.54	2.21	0.76	0.17
2212	48.85	17.25	1.74	9.19	6.09	7.43	3.98	2.21	2.28	0.82	0.16
2213	46.49	15.73	1.64	8.90	9.66	9.47	3.55	1.52	2.01	0.85	0.17
2217	51.22	17.77	1.80	9.02	3.77	7.01	4.47	1.60	2.33	0.83	0.18
2217A	57.15	16.70	1.35	6.01	4.08	6.58	3.77	2.27	1.62	0.33	0.13
2217B	48.55	12.82	1.60	8.40	14.00	9.97	2.32	0.76	1.19	0.22	0.17
2218	59.19	14.98	1.23	5.37	4.24	6.63	3.76	2.68	1.39	0.41	0.12
2219	49.95	13.49	1.48	7.57	13.08	9.07	2.51	1.16	1.23	0.29	0.16
2220	46.25	16.05	1.56	8.42	9.35	12.55	2.60	0.89	1.77	0.36	0.18
2221	61.56	16.96	1.12	4.58	2.13	5.54	4.47	2.06	1.29	0.17	0.09
2222A	60.68	17.42	1.12	4.63	3.01	5.39	3.99	2.16	1.31	0.18	0.10
2223	51.74	17.40	1.77	8.69	4.58	7.07	4.49	1.55	2.10	0.60	0.00
2223A	50.97	17.54	1.68	8.50	5.04	6.33	4.39	2.44	2.13	0.79	0.15
2226	49.50	17.77	1.82	9.36	5.13	7.98	4.39	1.26	2.27	0.51	0.00
2230	46.81	16.60	1.62	8.74	7.50	11.75	2.95	1.23	1.80	0.82	0.17
2232	50.48	17.52	1.60	8.09	4.81	8.89	4.20	1.81	2.00	0.60	0.00
2233	63.03	17.10	1.06	4.22	2.11	4.70	4.00	2.49	1.00	0.16	0.09
2233A	47.05	17.47	1.61	8.54	7.24	11.70	3.69	0.53	1.73	0.44	0.00
2233B	66.05	16.69	0.87	3.18	1.45	3.56	4.26	2.98	0.72	0.14	0.09
2234	52.59	16.23	1.59	7.76	5.90	7.61	3.89	1.95	2.05	0.44	0.00
2235	57.01	18.42	1.27	5.84	3.69	6.25	3.99	1.72	1.51	0.19	0.11
2302	49.50	16.79	1.70	8.74	6.27	6.99	4.63	2.21	2.28	0.74	0.15
2304	49.87	18.58	1.65	8.47	5.50	8.69	3.75	0.99	1.65	0.67	0.17

TABLE 3. ADJUSTED ANALYSES OF MAJOR OXIDES IN WEIGHT PERCENT, SOUTHWEST MAP AREA--Continued

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O[1]	K_2O[1]	TiO_2	P_2O_5[1]	MnO[2]
2307	54.40	18.05	1.54	7.16	3.74	6.71	4.60	1.69	1.53	0.57	0.00
2307A	48.86	18.26	1.77	9.10	5.77	8.88	3.79	1.01	2.03	0.53	0.00
2309	46.87	14.74	1.77	9.48	11.00	9.66	2.90	1.00	2.24	0.34	0.00
2309A	50.13	16.92	1.66	8.54	6.78	7.39	3.97	1.88	2.01	0.57	0.15
2311	52.99	14.42	1.47	7.09	7.39	7.57	4.11	2.32	1.96	0.53	0.14
2313	50.10	17.91	1.75	8.89	4.87	6.26	4.73	2.34	2.19	0.79	0.16
2316	49.74	16.34	1.60	8.14	7.68	8.67	3.93	1.50	1.84	0.54	0.00
2317	49.46	16.69	1.68	8.65	7.10	7.80	3.70	1.95	2.07	0.71	0.17
2317A	49.35	17.20	1.66	8.61	7.24	7.67	3.40	1.88	2.11	0.71	0.16
2318	48.88	17.09	1.79	9.30	6.41	6.99	4.45	2.06	2.25	0.76	0.00
2319	52.57	17.29	1.39	6.74	6.82	8.47	3.68	1.38	1.30	0.35	0.00
2322	49.76	18.40	1.72	8.66	5.83	8.27	3.64	1.22	1.93	0.41	0.16
2323	50.53	18.60	1.77	8.99	4.70	8.23	3.64	0.95	1.88	0.51	0.17
2325	48.83	20.01	1.78	9.22	4.91	8.14	3.69	0.82	1.89	0.51	0.19
2332	51.66	17.39	1.65	8.26	5.45	6.44	3.88	2.47	1.94	0.70	0.15
2332A	49.75	16.61	1.69	8.70	6.99	7.39	3.85	2.05	2.30	0.49	0.16
2332B	58.09	17.91	1.33	5.78	2.68	5.43	4.64	2.16	1.26	0.57	0.14
2333	48.11	18.07	1.93	10.12	5.65	8.04	3.61	1.08	2.55	0.66	0.18
2334	48.49	18.21	1.76	9.15	5.75	8.09	4.07	1.33	2.24	0.73	0.18
2335	46.75	18.25	1.75	9.42	7.13	9.59	3.23	1.01	2.15	0.52	0.17
2335A	47.45	18.32	1.89	9.98	6.09	8.60	3.68	0.87	2.40	0.56	0.17
2430	48.98	17.23	1.77	9.13	6.54	6.94	4.17	2.10	2.29	0.71	0.16
2Z03	46.86	14.88	1.67	9.07	9.58	12.09	2.33	0.90	2.00	0.46	0.17
2Z03A	50.07	17.08	1.74	8.92	5.52	8.46	3.61	1.49	2.33	0.60	0.17
2Z13	46.64	16.22	1.72	9.25	9.02	11.21	2.74	0.77	1.88	0.36	0.18
2Z14	52.74	17.42	1.62	7.85	4.89	7.59	3.83	1.54	1.81	0.56	0.15
2Z14A	52.69	17.55	1.62	7.83	4.83	7.59	3.83	1.54	1.81	0.54	0.15
2Z15	46.57	15.85	1.70	9.23	9.66	11.21	2.68	0.77	1.79	0.35	0.18
2Z15A	46.72	17.55	1.68	8.97	6.69	11.62	2.83	1.27	1.65	0.84	0.18
2Z23	47.72	17.11	1.62	8.48	6.86	11.30	3.12	1.30	1.59	0.74	0.17
2Z23A	48.80	17.92	1.77	9.29	5.37	8.91	3.63	1.26	2.13	0.72	0.18
2Z24	46.52	17.35	1.65	8.91	6.51	11.99	3.09	1.30	1.64	0.85	0.18
2Z25	47.99	17.04	1.68	8.86	7.78	9.84	3.20	1.06	1.78	0.58	0.18

2Z25A	49.08	18.18	1.63	8.50	6.01	9.32	3.60	0.94	2.02	0.54	0.15
2Z25B	49.59	17.83	1.76	9.02	5.25	8.66	3.75	1.06	2.10	0.79	0.16
2Z25C	49.25	18.23	1.65	8.41	6.26	9.01	3.61	0.91	2.01	0.51	0.16
2Z25D	48.16	14.16	1.64	8.75	10.15	10.99	2.66	1.05	1.86	0.41	0.17
2Z26	46.85	13.58	1.82	9.83	9.95	10.64	2.88	1.18	2.47	0.61	0.18
2Z27A	51.03	17.35	1.63	8.23	5.33	8.36	3.90	1.52	1.85	0.61	0.17
2Z28	48.01	16.83	1.74	9.23	7.32	10.08	2.98	1.06	1.96	0.58	0.18
3113	48.03	16.36	1.57	8.29	9.01	10.84	2.80	1.03	1.47	0.42	0.16
3117	47.42	15.39	1.58	8.46	9.49	12.29	2.44	0.73	1.54	0.49	0.17
3120	45.43	14.56	1.52	8.41	9.75	14.79	2.34	0.88	1.34	0.80	0.18
3121	45.77	15.93	1.63	9.00	8.40	13.35	2.47	0.93	1.69	0.66	0.18
3121A	49.05	12.52	1.49	7.85	14.06	9.85	2.34	1.06	1.06	0.54	0.17
3121B	48.95	18.35	1.66	8.54	5.60	9.64	3.45	1.13	1.79	0.70	0.16
3126	48.28	13.16	1.46	7.71	11.31	13.03	2.37	0.81	1.18	0.52	0.16
3134	46.61	17.60	1.63	8.85	6.85	12.94	2.67	0.66	1.36	0.65	0.17
3134A	49.33	17.69	1.89	9.76	5.02	7.96	3.51	1.35	2.73	0.60	0.16
3134B	47.69	15.75	1.78	9.55	8.42	9.04	3.22	1.27	2.51	0.57	0.17
3135	47.74	17.61	1.76	9.32	6.19	10.37	3.00	0.94	1.96	0.40	0.71
3135A	47.25	17.88	1.72	9.21	7.06	10.80	2.80	0.85	1.88	0.37	0.18
3136	46.04	17.29	1.65	9.01	7.69	13.09	2.59	0.56	1.23	0.66	0.18
3201	50.41	18.33	1.72	8.62	5.31	8.17	3.79	1.23	1.83	0.39	0.17
3211	47.84	14.90	1.56	8.35	9.95	11.22	2.95	0.91	1.55	0.59	0.17
3212	47.48	17.68	1.72	9.09	7.68	10.12	3.26	0.77	1.81	0.38	0.00
3212A	48.66	15.90	1.71	8.99	8.16	9.47	3.18	1.18	2.10	0.48	0.17
3214	48.12	16.33	1.69	9.01	8.60	9.49	2.94	1.14	2.10	0.39	0.17
3215	48.56	15.35	1.66	8.70	10.65	8.45	2.89	1.20	1.87	0.49	0.16
3218	47.11	17.40	1.77	9.60	6.13	10.31	3.12	1.28	2.52	0.58	0.18
3221	49.83	16.53	1.53	7.88	8.02	9.88	3.16	1.17	1.46	0.40	0.15
3222	47.93	14.35	1.57	8.36	11.78	10.93	2.78	0.50	1.38	0.42	0.00
3223	48.01	17.42	2.00	10.52	5.31	7.68	4.08	1.20	3.16	0.60	0.00
3226	47.52	15.44	1.66	8.85	9.94	9.59	3.35	1.14	1.77	0.57	0.17
3226A	48.41	17.34	1.09	5.71	10.56	14.15	1.86	0.07	0.67	0.00	0.12
3226B	49.34	13.32	1.66	8.48	12.21	11.63	2.13	0.11	0.93	0.03	0.16
3226C	40.34	0.37	1.84	10.89	46.19	0.11	0.00	0.01	0.05	0.03	0.15
3226D	45.92	4.77	1.31	7.17	26.18	12.44	0.72	0.02	0.63	0.01	0.15
3226E	49.17	3.39	0.93	4.83	22.05	18.27	0.54	0.01	0.26	0.00	0.13
3226F	47.82	4.04	1.26	6.63	23.27	14.87	0.79	0.03	0.44	0.04	0.16
3226G	44.94	6.91	1.85	10.22	21.21	12.19	0.83	0.02	1.18	0.01	0.17
3226H	47.04	6.85	1.47	7.85	19.28	15.01	1.02	0.09	0.92	0.00	0.17

TABLE 3. ADJUSTED ANALYSES OF MAJOR OXIDES IN WEIGHT PERCENT, SOUTHWEST MAP AREA--Continued

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O[1]	K_2O[1]	TiO_2	P_2O_5[1]	MnO[2]
3226J	48.30	14.57	1.72	9.11	9.88	9.58	3.46	1.32	2.04	0.00	0.00
3226K	39.75	0.20	2.00	12.08	45.72	0.01	0.00	0.00	0.06	0.03	0.15
3226L	46.31	7.91	1.61	8.75	20.45	13.00	0.85	0.00	0.94	0.00	0.17
3226M	49.15	5.31	1.08	5.56	17.77	19.56	0.89	0.00	0.50	0.00	0.16
32260	52.38	18.14	1.61	7.85	5.21	7.83	3.88	1.34	1.33	0.44	0.00
3226P	46.50	13.89	1.68	9.08	11.78	10.51	3.19	0.96	1.83	0.60	0.00
3228	46.85	14.86	1.63	8.74	11.59	9.82	2.97	1.02	1.80	0.53	0.17
3228A	49.50	18.49	1.61	8.28	6.08	9.04	3.35	1.31	1.68	0.50	0.15
3235	46.02	14.26	1.65	8.99	10.96	11.72	3.03	0.86	1.74	0.77	0.00
3236	47.69	16.13	1.67	8.74	8.62	9.58	3.53	1.29	1.96	0.78	0.00
3236A	51.78	17.01	1.70	8.32	5.08	6.21	4.97	2.29	2.03	0.61	0.00
3236B	47.47	15.78	1.68	8.91	8.92	10.02	3.21	1.28	1.97	0.73	0.00
3236C	50.40	17.44	1.70	8.65	5.48	6.33	4.48	2.51	2.19	0.66	0.16
3301	48.76	17.57	1.88	9.73	5.27	7.77	4.05	1.27	2.87	0.65	0.18
3304	48.90	16.49	1.73	8.94	7.28	7.88	3.89	1.90	2.11	0.71	0.17
3305	49.63	17.45	1.79	9.16	5.50	8.52	3.82	1.20	2.37	0.56	0.00
3305A	49.26	19.01	1.67	8.52	5.50	8.36	3.93	1.13	2.04	0.41	0.16
3305B	48.12	16.06	1.73	9.09	8.32	8.13	3.74	1.68	2.38	0.58	0.17
3307	50.57	17.90	1.70	8.51	5.48	8.50	3.88	1.19	1.80	0.47	0.00
3311	49.51	17.33	1.57	7.99	7.66	10.35	2.79	0.85	1.41	0.37	0.16
3313	53.92	16.97	1.75	8.17	3.62	5.79	4.77	2.00	2.15	0.69	0.15
3319	46.53	15.57	1.84	9.88	9.72	9.15	3.38	1.09	2.32	0.50	0.00
3323	48.42	15.34	1.64	8.51	8.80	8.66	3.99	1.65	2.16	0.65	0.16
3324	48.20	16.05	1.61	8.41	8.86	8.41	3.78	1.68	2.12	0.69	0.17
3325	51.99	15.54	1.63	7.96	8.03	8.29	3.62	1.19	1.33	0.28	0.15
3326	48.80	17.22	1.72	8.84	8.04	11.05	2.13	0.44	1.29	0.30	0.17
3327	48.26	15.81	1.77	9.27	7.72	8.12	3.97	1.78	2.46	0.66	0.17
3331	50.96	17.38	1.72	8.54	5.27	6.49	4.60	2.29	2.09	0.64	0.00
3333	50.67	16.77	1.72	8.58	5.72	6.59	4.76	2.41	2.07	0.69	0.00
3333A	76.08	13.14	0.26	0.72	0.01	0.41	4.77	4.48	0.09	0.02	0.00
3335	74.28	14.18	0.29	0.87	0.25	1.03	4.79	4.16	0.07	0.03	0.06
3405	49.95	13.47	1.59	8.13	10.70	10.29	2.31	1.20	1.31	0.54	0.00
3407	54.44	16.88	1.70	8.00	3.76	5.55	4.88	1.95	2.06	0.63	0.14

3407A	49.26	16.21	1.74	8.94	8.20	8.64	3.62	1.08	1.71	0.43	0.17
3407B	85.22	7.26	0.94	1.81	0.68	0.98	1.18	1.34	0.44	0.08	0.05
3430	74.54	14.10	0.30	0.86	0.21	1.05	4.82	3.94	0.08	0.04	0.04
3Z13	49.63	16.39	1.65	8.40	7.88	7.97	3.60	1.61	2.13	0.57	0.16
3Z13A	45.93	15.67	1.60	8.71	8.30	13.24	2.85	1.09	1.53	0.88	0.18
3Z22	46.68	14.05	1.61	8.71	9.76	13.90	2.15	0.88	1.61	0.49	0.17
3Z26	49.05	17.34	1.75	9.10	5.82	8.77	3.58	1.40	2.41	0.59	0.18
3Z33	52.45	16.44	1.57	7.66	5.87	8.21	3.59	1.76	1.85	0.46	0.15
3Z36	52.41	17.35	1.70	8.17	4.37	7.16	4.37	1.61	1.94	0.74	0.17
3Z36A	50.34	17.85	1.65	8.37	5.29	8.64	3.69	1.52	2.05	0.44	0.15
4213	56.56	16.80	1.54	6.89	3.14	5.40	4.86	2.43	1.82	0.42	0.15
4214	51.39	17.30	1.68	8.29	5.52	8.13	4.05	1.22	1.79	0.63	0.00
4225	46.98	14.71	1.64	8.83	11.44	10.65	2.44	0.81	1.72	0.58	0.18
4226	46.37	16.27	1.73	9.35	9.20	10.55	2.91	0.77	1.93	0.74	0.19
4227	52.94	17.10	1.64	7.93	5.02	7.41	4.36	1.40	1.69	0.49	0.00
4234	47.87	17.33	1.79	9.45	6.19	9.70	3.15	1.28	2.53	0.54	0.17
4236	52.23	16.64	1.59	7.86	5.24	8.91	4.12	1.32	1.61	0.47	0.00
4236A	50.74	18.04	1.54	7.76	6.67	9.37	3.41	0.82	1.16	0.50	0.00
4301	59.91	13.60	1.04	4.35	5.16	7.84	3.54	3.11	0.85	0.60	0.00
4302	50.16	17.78	1.56	7.95	6.31	9.04	3.75	1.14	1.73	0.44	0.16
4302A	49.88	17.88	1.55	7.93	6.34	9.05	3.64	1.13	1.72	0.70	0.16
4303	48.86	16.61	1.76	9.09	7.92	9.10	3.22	0.93	1.92	0.41	0.17
4311	49.72	15.38	1.70	8.73	7.97	9.67	3.48	1.00	1.78	0.54	0.00
4313	49.45	16.19	1.63	8.37	7.98	11.10	2.81	0.75	1.35	0.38	0.00
4313A	48.96	16.02	1.63	8.45	8.54	11.08	2.76	0.71	1.36	0.33	0.16
4314	60.50	13.90	1.05	4.38	4.48	7.25	3.62	3.25	0.98	0.59	0.00
4315	46.12	16.18	1.66	9.00	8.80	12.84	2.40	0.66	1.31	0.83	0.18
4316	47.31	17.20	1.66	8.83	7.45	12.20	2.91	0.54	1.49	0.40	0.00
4319	48.27	16.42	1.72	9.04	7.61	9.70	3.50	1.03	2.16	0.54	0.00
4321	53.67	16.00	1.43	6.80	7.25	8.11	3.47	1.48	1.31	0.34	0.14
4322	45.74	15.53	1.76	9.53	9.33	10.98	2.86	1.27	2.25	0.56	0.20
4323	49.53	17.66	1.58	8.08	6.97	10.04	3.08	0.88	1.42	0.58	0.16
4323A	47.22	18.34	1.64	8.75	6.58	11.84	2.90	0.56	1.48	0.50	0.17
4324	49.04	15.65	1.67	8.62	9.14	9.61	3.18	1.00	1.74	0.35	0.00
4324A	50.50	14.23	1.52	7.69	11.67	8.97	2.68	1.08	1.20	0.30	0.14
4325	50.51	17.73	1.65	8.28	6.24	9.94	2.90	0.79	1.37	0.42	0.16
4326	45.77	15.34	1.73	9.45	9.40	11.36	2.75	1.20	2.24	0.54	0.19
4326A	47.80	18.38	1.59	8.35	7.16	11.34	2.77	0.61	1.43	0.38	0.17
4331	49.45	15.97	1.59	8.17	8.62	9.52	3.40	1.19	1.66	0.41	0.00

TABLE 3. ADJUSTED ANALYSES OF MAJOR OXIDES IN WEIGHT PERCENT, SOUTHWEST MAP AREA--Continued

Sample No.	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O[1]	K_2O[1]	TiO_2	P_2O_5[1]	MnO[2]
4332	48.37	16.79	1.69	8.82	9.69	9.57	2.36	0.91	1.47	0.32	0.00
4336	54.90	17.05	1.44	6.64	4.98	8.08	3.30	1.98	1.09	0.39	0.14
4406	46.65	15.95	1.64	8.83	8.36	11.99	2.87	1.06	1.69	0.77	0.18
4407A	47.49	15.91	1.65	8.75	8.77	11.47	2.61	0.92	1.80	0.45	0.18
4418	58.78	18.11	1.25	5.36	2.84	5.76	4.27	1.93	1.32	0.25	0.11
4418A	55.04	16.85	1.44	6.66	5.33	7.26	3.55	1.81	1.60	0.30	0.14
4430	48.78	17.99	1.77	9.21	6.18	8.42	3.53	1.22	2.37	0.36	0.16
4431	59.61	14.82	1.25	5.21	4.64	6.79	3.38	2.84	1.03	0.42	0.00

[1]0.00, value below limit of detection.

[2]0.00, not determined.

TABLE 4. CIPW NORMATIVE COMPOSITIONS, SOUTHWEST MAP AREA

Sample No.	Q	C	or	ab	an	di	hy	ol	lc	ne	cs	mt	il	ap	di			hy		ol	
															wo	en	fs	en	fs	fo	fa
0301	0.00	0.00	5.16	20.03	32.81	14.01	0.00	18.74	0.00	3.43	0.00	2.49	2.43	0.94	7.15	3.98	2.89	0.00	0.00	10.41	8.33
0305	0.00	0.00	5.03	20.41	26.35	18.15	0.00	22.77	0.00	1.43	0.00	2.34	2.81	0.74	9.39	6.09	2.66	0.00	0.00	15.37	7.40
1101	0.00	0.00	6.57	15.94	28.29	16.23	0.00	17.60	0.00	6.43	0.00	2.69	4.65	1.64	8.29	4.70	3.23	0.00	0.00	10.02	7.59
1101A	0.00	0.00	11.21	37.70	23.11	5.84	8.75	6.09	0.00	0.00	0.00	2.28	3.18	1.88	2.95	1.45	1.44	4.40	4.35	2.91	3.18
1101B	0.00	0.00	8.71	24.39	27.23	13.81	0.00	14.45	0.00	4.05	0.00	2.46	3.26	1.67	7.01	3.71	3.08	0.00	0.00	7.55	6.91
1102	0.00	0.00	6.86	18.31	28.81	15.68	0.00	17.00	0.00	4.43	0.00	2.65	4.64	1.65	7.99	4.43	3.26	0.00	0.00	9.38	7.62
1103	0.26	0.00	12.23	28.92	18.69	14.64	19.75	0.00	0.00	0.00	0.00	1.91	2.37	1.27	7.56	4.81	2.27	13.42	6.33	0.00	0.00
1104	0.00	0.00	7.49	28.29	26.08	10.08	0.00	18.20	0.00	1.36	0.00	2.59	4.68	1.27	5.15	2.95	1.98	0.00	0.00	10.47	7.73
1105	0.00	0.00	8.04	31.27	26.16	10.85	4.69	11.78	0.00	0.00	0.00	2.34	3.51	1.40	5.54	3.11	2.21	2.74	1.95	6.61	5.17
1110	0.00	0.00	7.78	29.70	29.49	7.14	6.60	11.52	0.00	0.00	0.00	2.50	3.53	1.78	3.61	1.82	1.71	3.40	3.20	5.66	5.87
1110A	2.87	0.00	12.74	30.95	19.47	14.92	13.57	0.00	0.00	0.00	0.00	1.90	2.33	1.28	7.64	4.42	2.87	8.23	5.34	0.00	0.00
1110B	0.00	0.00	8.28	24.64	32.19	7.59	11.02	8.72	0.00	0.00	0.00	2.54	3.37	1.69	3.85	1.99	1.75	5.86	5.16	4.43	4.29
1111	0.00	0.00	8.59	27.70	30.06	10.10	4.74	11.25	0.00	0.00	0.00	2.52	3.32	1.76	5.10	2.50	2.50	2.37	2.37	5.35	5.90
1122	5.97	0.02	14.46	49.95	14.29	0.00	9.79	0.00	0.00	0.00	0.00	1.85	2.01	1.69	0.00	0.00	0.00	2.59	7.20	0.00	0.00
1123	0.00	0.00	6.52	18.41	27.61	19.47	0.00	16.16	0.00	4.28	0.00	2.52	3.62	1.45	9.97	5.78	3.73	0.00	0.00	9.45	6.71
1123A	0.00	0.00	8.45	21.12	27.72	18.40	0.00	12.95	0.00	4.07	0.00	2.54	3.14	1.65	9.32	4.77	4.31	0.00	0.00	6.49	6.46
1135	0.00	0.00	7.26	15.62	26.48	22.08	0.00	15.23	0.00	5.85	0.00	2.39	3.15	1.99	11.28	6.44	4.36	0.00	0.00	8.73	6.51
1136	0.00	0.00	3.35	11.95	28.75	30.46	0.00	15.99	0.00	3.08	0.00	2.44	2.34	1.68	15.65	9.45	5.35	0.00	0.00	9.85	6.15
1136A	0.00	0.00	8.48	32.08	24.56	11.18	0.90	15.08	0.00	0.00	0.00	2.49	3.82	1.44	5.70	3.19	2.29	0.52	0.38	8.41	6.67
1201	0.00	0.00	7.61	13.87	33.67	19.64	0.00	14.27	0.00	3.60	0.00	2.31	3.48	1.60	10.03	5.64	3.97	0.00	0.00	8.04	6.23
1202	19.71	0.66	17.56	35.64	15.38	0.00	7.48	0.00	0.00	0.00	0.00	1.18	1.27	1.14	0.00	0.00	0.00	3.45	4.03	0.00	0.00
1203	20.18	0.00	18.22	33.52	15.12	2.37	7.68	0.00	0.00	0.00	0.00	1.23	1.31	0.37	1.20	0.63	0.54	4.11	3.57	0.00	0.00
1203A	18.48	0.00	19.90	37.04	13.56	1.62	6.47	0.00	0.00	0.00	0.00	1.21	1.30	0.44	0.82	0.38	0.43	3.00	3.46	0.00	0.00
1204	5.03	0.00	12.29	43.71	17.27	3.58	11.98	0.00	0.00	0.00	0.00	2.19	2.60	1.37	1.77	0.65	1.15	4.33	7.66	0.00	0.00
1206	12.91	0.25	15.02	36.76	20.07	0.00	10.78	0.00	0.00	0.00	0.00	1.62	1.81	0.80	0.00	0.00	0.00	4.75	6.03	0.00	0.00
1207	0.00	0.00	7.35	37.50	20.60	13.16	11.62	4.68	0.00	0.00	0.00	2.04	2.81	0.24	6.78	4.18	2.20	7.61	4.01	2.96	1.72
1208	18.53	0.00	18.19	35.48	15.79	0.70	8.04	0.00	0.00	0.00	0.00	1.32	1.48	0.48	0.35	0.17	0.18	3.91	4.14	0.00	0.00
1209	18.22	1.45	16.70	36.75	15.52	0.00	8.08	0.00	0.00	0.00	0.00	1.30	1.48	0.52	0.00	0.00	0.00	3.60	4.48	0.00	0.00
1209A	15.90	0.17	17.63	36.49	17.61	0.00	8.71	0.00	0.00	0.00	0.00	1.35	1.71	0.46	0.00	0.00	0.00	4.27	4.43	0.00	0.00
1209B	17.04	0.00	15.52	38.34	17.38	0.72	7.71	0.00	0.00	0.00	0.00	1.33	1.45	0.53	0.36	0.16	0.20	3.49	4.22	0.00	0.00
1209C	0.00	0.00	7.87	28.86	31.62	4.79	8.06	11.36	0.00	0.00	0.00	2.32	3.58	1.57	2.44	1.30	1.06	4.44	3.62	5.99	5.37
1212	0.00	0.00	6.48	17.44	33.27	15.40	0.00	15.83	0.00	4.52	0.00	2.28	3.59	1.23	7.88	4.53	2.99	0.00	0.00	9.16	6.67
1215	0.00	0.00	9.90	28.60	25.50	13.83	0.00	12.28	0.00	3.07	0.00	2.31	3.30	1.24	7.02	3.67	3.14	0.00	0.00	6.32	5.96
1215A	0.00	0.00	4.45	12.21	31.78	22.88	0.00	15.20	0.00	6.28	0.00	2.38	3.17	1.69	11.72	6.84	4.32	0.00	0.00	8.96	6.24

TABLE 4. CIPW NORMATIVE COMPOSITIONS, SOUTHWEST MAP AREA--Continued

Sample No.	Q	C	or	ab	an	di	hy	ol	lc	ne	cs	mt	il	ap	di			hy		ol	
															wo	en	fs	en	fs	fo	fa
1215B	23.55	0.66	7.59	47.48	16.04	0.00	3.34	0.00	0.00	0.00	0.00	0.69	0.52	0.14	0.00	0.00	0.00	1.23	2.11	0.00	0.00
1215C	0.00	0.00	5.31	23.55	26.00	22.20	0.00	15.12	0.00	1.28	0.00	2.38	3.22	0.97	11.38	6.73	4.09	0.00	0.00	9.06	6.06
1215D	0.00	0.00	0.06	4.36	12.82	14.94	0.00	62.69	0.00	0.60	0.00	3.34	1.13	0.07	7.80	5.47	1.67	0.00	0.00	46.88	15.81
1215E	0.00	0.00	0.63	10.88	17.97	20.67	2.59	41.10	0.00	0.00	0.00	3.54	2.56	0.05	10.68	6.79	3.21	1.76	0.83	27.03	14.08
1215F	0.00	0.00	0.19	5.88	15.18	53.41	0.00	18.27	0.00	2.18	0.00	2.54	2.36	0.00	27.70	18.31	7.40	0.00	0.00	12.64	5.63
1215G	0.00	0.00	0.31	1.86	12.35	65.89	0.00	13.28	0.00	3.07	0.00	1.62	1.45	0.20	34.63	25.70	5.55	0.00	0.00	10.72	2.55
1216	0.00	0.00	2.80	14.55	27.27	28.19	0.00	16.91	0.00	3.18	0.00	2.45	3.02	1.67	14.47	8.64	5.08	0.00	0.00	10.26	6.65
1216A	0.00	0.00	6.37	5.11	25.05	28.50	0.00	17.91	0.00	10.00	0.00	2.32	2.75	2.03	14.71	9.32	4.47	0.00	0.00	11.72	6.19
1216B	0.00	0.00	2.62	6.36	27.06	37.72	0.00	13.25	0.00	6.08	0.00	2.38	2.91	1.65	19.39	11.76	6.57	0.00	0.00	8.20	5.05
1217	15.97	0.00	16.04	39.84	16.00	1.44	7.40	0.00	0.00	0.00	0.00	1.32	1.60	0.41	0.72	0.34	0.37	3.57	3.83	0.00	0.00
1217A	16.68	0.00	16.67	38.97	16.51	0.47	7.72	0.00	0.00	0.00	0.00	1.20	1.38	0.42	0.24	0.11	0.12	3.74	3.98	0.00	0.00
1217B	20.02	0.00	15.52	35.90	16.75	1.12	7.59	0.00	0.00	0.00	0.00	1.30	1.32	0.48	0.56	0.27	0.28	3.75	3.84	0.00	0.00
1217C	20.94	0.00	17.44	37.04	14.41	0.46	6.76	0.00	0.00	0.00	0.00	1.22	1.33	0.41	0.23	0.11	0.12	3.19	3.57	0.00	0.00
1218	16.81	0.00	17.21	40.19	14.30	2.07	6.52	0.00	0.00	0.00	0.00	1.27	1.30	0.36	1.04	0.50	0.53	3.18	3.34	0.00	0.00
1218B	18.19	0.00	17.09	37.71	14.93	2.42	6.60	0.00	0.00	0.00	0.00	1.25	1.42	0.41	1.22	0.59	0.61	3.25	3.35	0.00	0.00
1218C	1.69	0.00	16.36	28.66	10.93	20.13	16.07	0.00	0.00	0.00	0.00	2.12	3.12	0.96	10.39	6.56	3.18	10.82	5.25	0.00	0.00
1218D	25.87	0.00	23.92	34.60	7.78	1.24	4.38	0.00	0.00	0.00	0.00	1.01	0.92	0.29	0.62	0.26	0.36	1.86	2.53	0.00	0.00
1218E	25.89	0.00	25.66	33.82	7.60	1.02	4.01	0.00	0.00	0.00	0.00	0.94	0.79	0.29	0.51	0.21	0.30	1.64	2.37	0.00	0.00
1218F	0.00	0.00	5.88	25.90	28.21	17.18	0.00	14.62	0.00	1.55	0.00	2.46	3.30	0.94	8.75	4.79	3.65	0.00	0.00	7.94	6.67
1220	18.10	0.00	19.66	34.12	16.22	1.21	7.67	0.00	0.00	0.00	0.00	1.26	1.36	0.41	0.61	0.30	0.30	3.87	3.81	0.00	0.00
1221	19.79	0.00	17.39	37.56	13.96	1.73	6.74	0.00	0.00	0.00	0.00	1.19	1.29	0.36	0.87	0.43	0.42	3.42	3.32	0.00	0.00
1221A	0.00	0.00	0.31	4.38	4.84	22.57	2.48	61.35	0.00	0.00	0.00	3.08	0.95	0.05	11.82	8.54	2.21	1.97	0.51	47.74	13.61
1221B	0.00	0.00	6.99	33.00	30.04	5.12	16.91	1.87	0.00	0.00	0.00	2.35	3.07	0.67	2.60	1.34	1.19	8.97	7.94	0.95	0.92
1221C	0.00	0.00	6.46	24.07	27.96	18.58	0.00	14.59	0.00	1.95	0.00	2.41	2.98	1.01	9.50	5.46	3.62	0.00	0.00	8.43	6.17
1222	0.00	0.00	5.21	18.43	28.11	20.15	0.00	17.95	0.00	3.00	0.00	2.45	3.75	0.97	10.37	6.32	3.47	0.00	0.00	11.19	6.76
1223	0.00	0.00	10.49	41.25	23.28	2.27	9.63	5.35	0.00	0.00	0.00	2.44	3.76	1.58	1.13	0.46	0.68	3.89	5.74	2.04	3.31
1224	0.05	0.00	9.86	30.65	20.51	14.49	18.02	0.00	0.00	0.00	0.00	2.23	3.15	1.06	7.43	4.40	2.66	11.23	6.79	0.00	0.00
1224A	0.35	0.00	10.53	41.10	22.78	2.03	15.76	0.00	0.00	0.00	0.00	2.33	3.42	1.75	1.01	0.42	0.60	6.51	9.25	0.00	0.00
1226	0.00	0.00	9.92	26.70	24.45	18.64	0.00	11.83	0.00	2.21	0.00	2.07	3.11	1.10	9.57	5.76	3.31	0.00	0.00	7.24	4.59
1226A	0.00	0.00	6.14	33.21	26.68	9.93	2.06	14.93	0.00	0.00	0.00	2.56	3.45	1.06	5.06	2.76	2.11	1.17	0.89	8.10	6.83
1227	0.00	0.00	12.34	32.02	20.67	17.22	3.27	8.16	0.00	0.00	0.00	2.17	2.75	1.45	8.79	4.90	3.53	1.90	1.37	4.55	3.61
1227A	0.00	0.00	9.44	31.92	26.03	10.40	1.39	13.15	0.00	0.00	0.00	2.48	3.86	1.37	5.28	2.80	2.32	0.76	0.63	6.88	6.27
1227B	0.00	0.00	4.55	15.19	29.39	21.31	0.00	16.98	0.00	4.59	0.00	2.46	3.60	0.85	10.96	5.55	3.70	0.00	0.00	10.53	5.46
1229	0.00	0.00	7.05	32.46	30.54	5.46	16.56	2.06	0.00	0.00	0.00	2.28	2.95	0.66	2.77	1.48	1.21	9.12	7.43	1.09	0.98

1231	0.00	0.00	5.83	12.94	25.76	25.72	0.00	16.37	0.00	6.18	0.00	2.48	3.38	1.38	13.22	7.99	4.51	0.00	0.00	10.09	6.28
1231A	13.72	0.67	20.53	48.73	8.39	0.00	5.63	0.00	0.00	0.00	0.00	1.36	0.61	0.38	0.00	0.00	0.00	0.63	5.00	0.00	0.00
1231B	0.00	0.00	9.01	34.49	24.46	9.74	3.40	11.28	0.00	0.00	0.00	2.40	3.65	1.59	4.95	2.63	2.17	1.86	1.54	5.91	5.38
1231C	0.00	0.00	8.72	30.69	25.68	10.56	3.88	12.67	0.00	0.00	0.00	2.48	3.78	1.58	5.38	2.92	2.26	2.19	1.69	6.84	5.83
1232	2.88	0.00	14.98	36.95	18.21	6.70	14.88	0.00	0.00	0.00	0.00	2.05	2.51	0.84	3.40	1.75	1.56	7.88	7.00	0.00	0.00
1233	0.00	0.00	3.85	14.07	26.27	27.60	0.00	15.34	0.00	6.26	0.00	2.36	2.61	1.66	14.19	8.61	4.81	0.00	0.00	9.50	5.85
1234	0.00	0.00	5.78	9.86	27.01	25.55	0.00	16.68	0.00	8.39	0.00	2.37	2.76	1.63	13.14	7.98	4.44	0.00	0.00	10.34	6.34
1234A	0.00	0.00	4.60	14.37	21.95	21.74	0.00	27.58	0.00	3.63	0.00	2.33	2.49	1.34	11.30	7.63	2.80	0.00	0.00	19.64	7.94
1236	0.00	0.00	3.76	30.96	31.24	10.22	0.00	15.57	0.00	0.57	0.00	2.51	3.99	1.21	5.18	2.68	2.36	0.00	0.00	7.91	7.66
1301	0.00	0.00	2.48	9.82	21.79	29.64	0.00	22.08	0.00	6.39	0.00	2.39	3.67	1.79	15.38	10.24	4.02	0.00	0.00	15.42	6.66
1301A	6.71	0.12	13.63	41.85	20.33	0.00	12.07	0.00	0.00	0.00	0.00	1.77	1.84	1.73	0.00	0.00	0.00	4.84	7.23	0.00	0.00
1305	25.44	1.81	22.31	40.55	6.30	0.00	2.48	0.00	0.00	0.00	0.00	0.72	0.35	0.05	0.00	0.00	0.00	0.08	2.41	0.00	0.00
1305A	5.93	0.00	15.59	37.73	17.62	5.59	11.66	0.00	0.00	0.00	0.00	1.87	2.88	1.16	2.83	1.42	1.34	5.99	5.67	0.00	0.00
1309	0.00	0.00	5.94	28.72	32.86	6.21	6.83	12.51	0.00	0.00	0.00	2.51	3.14	1.31	3.14	1.61	1.46	3.58	3.24	6.26	6.25
1311	0.00	0.00	7.04	25.59	30.12	9.52	0.00	19.32	0.00	1.54	0.00	2.66	2.69	1.57	4.83	2.52	2.18	0.00	0.00	9.89	9.42
1312	13.14	0.00	17.17	40.53	16.12	0.01	9.75	0.00	0.00	0.00	0.00	1.37	1.22	0.71	0.00	0.00	0.00	4.89	4.86	0.00	0.00
1315	2.58	0.00	12.79	31.69	20.47	10.25	18.36	0.00	0.00	0.00	0.00	1.87	1.11	0.90	5.25	3.08	1.92	11.31	7.05	0.00	0.00
1316	0.00	0.00	7.51	32.27	30.15	4.91	17.14	1.76	0.00	0.00	0.00	2.27	2.69	1.34	2.48	1.22	1.21	8.63	8.51	0.84	0.92
1317	0.00	0.00	13.18	38.33	20.12	10.13	0.00	9.60	0.00	0.33	0.00	2.31	4.12	1.94	5.09	2.36	2.68	0.00	0.00	4.26	5.34
1319	0.00	0.00	7.55	25.10	27.29	19.07	0.00	13.76	0.00	0.17	0.00	2.32	3.30	1.48	9.76	5.62	3.69	0.00	0.00	7.99	5.78
1320	0.00	0.00	13.72	39.79	19.40	6.98	11.78	1.16	0.00	0.00	0.00	2.08	3.49	1.65	3.53	1.76	1.70	5.99	5.79	0.56	0.60
1321	0.00	0.00	7.91	5.94	21.71	31.90	0.00	14.08	0.00	10.51	0.00	2.28	4.10	1.60	16.46	10.34	5.11	0.00	0.00	9.12	4.96
1328	0.00	0.00	10.93	28.58	15.96	19.52	5.81	12.05	0.00	0.00	0.00	2.35	3.75	1.08	10.07	6.31	3.15	3.87	1.93	7.78	4.28
1330	0.00	0.00	8.39	21.19	20.35	22.77	0.00	17.15	0.00	3.13	0.00	2.22	3.76	1.06	11.79	7.68	3.31	0.00	0.00	11.63	5.52
1330A	0.00	0.00	5.88	18.10	27.63	21.21	0.00	17.71	0.00	2.53	0.00	2.40	3.76	0.79	10.92	6.75	3.54	0.00	0.00	11.22	6.48
1331	0.00	0.00	8.95	27.10	23.09	13.72	16.75	4.84	0.00	0.00	0.00	2.30	2.76	0.51	7.05	4.25	2.42	10.68	6.07	2.98	1.86
1331A	0.00	0.00	4.68	20.93	23.12	21.18	0.00	23.05	0.00	1.44	0.00	2.15	2.50	1.00	11.01	7.44	2.73	0.00	0.00	16.41	6.63
1331B	0.00	0.00	2.88	10.36	20.53	27.83	0.00	24.98	0.00	6.16	0.00	2.33	3.76	1.20	14.49	9.91	3.43	0.00	0.00	18.08	6.90
1331C	0.00	0.00	6.19	21.42	27.89	19.55	0.00	15.94	0.00	1.91	0.00	2.39	3.75	1.00	10.03	5.99	3.53	0.00	0.00	9.66	6.27
1332	1.78	0.00	9.22	25.64	23.96	11.07	22.64	0.00	0.00	0.00	0.00	2.35	2.73	0.62	5.67	3.35	2.05	14.05	8.59	0.00	0.00
1334	0.00	0.00	3.76	22.83	30.20	15.03	4.21	17.16	0.00	0.00	0.00	2.51	3.64	0.68	7.72	4.67	2.64	2.69	1.52	10.58	6.58
1418	5.19	0.00	9.05	36.55	26.17	1.63	15.40	0.00	0.00	0.00	0.00	2.16	2.50	1.37	0.81	0.35	0.47	6.57	8.83	0.00	0.00
1419	2.30	0.00	10.78	33.35	26.96	3.40	17.36	0.00	0.00	0.00	0.00	2.01	2.94	0.94	1.73	0.93	0.74	9.67	7.69	0.00	0.00
1419A	0.00	0.00	10.10	29.45	23.73	14.55	5.68	10.20	0.00	0.00	0.00	2.07	3.13	1.13	7.48	4.58	2.48	3.69	2.00	6.39	3.81
1419B	2.60	0.00	11.60	34.85	26.14	3.62	16.47	0.00	0.00	0.00	0.00	2.01	1.79	0.94	1.82	0.88	0.91	8.10	8.37	0.00	0.00
1419C	1.18	0.00	10.48	32.40	26.24	8.08	15.31	0.00	0.00	0.00	0.00	2.06	3.20	1.07	4.11	2.20	1.77	8.49	6.83	0.00	0.00
1430	0.00	0.00	6.75	26.39	30.16	12.50	3.98	14.84	0.00	0.00	0.00	2.38	2.25	0.77	6.39	3.61	2.50	2.35	1.63	8.41	6.43
2101	0.00	0.00	4.44	21.36	35.17	14.84	0.00	16.46	0.00	1.22	0.00	2.41	2.72	1.42	7.56	4.12	3.17	0.00	0.00	8.91	7.55
2102	0.00	0.00	7.68	20.52	28.17	17.83	0.00	15.14	0.00	3.52	0.00	2.41	2.93	1.86	9.09	5.03	3.71	0.00	0.00	8.36	6.78

TABLE 4. CIPW NORMATIVE COMPOSITIONS, SOUTHWEST MAP AREA--Continued

Sample No.	Q	C	or	ab	an	di	hy	ol	lc	ne	cs	mt	il	ap	di			hy		ol	
															wo	en	fs	en	fs	fo	fa
2104	0.00	0.00	7.16	30.67	26.79	11.57	1.80	14.60	0.00	0.00	0.00	2.43	3.76	1.27	5.90	3.31	2.35	1.05	0.75	8.18	6.41
2105	0.00	0.00	6.07	21.93	31.82	14.90	0.00	16.09	0.00	1.65	0.00	2.44	3.88	1.24	7.61	4.31	2.98	0.00	0.00	9.14	6.95
2105A	0.00	0.00	6.03	19.07	30.12	18.96	0.00	16.29	0.00	2.54	0.00	2.34	3.53	1.15	9.74	5.81	3.42	0.00	0.00	9.88	6.41
2105B	0.00	0.00	6.19	20.21	33.26	15.55	0.00	15.11	0.00	2.48	0.00	2.29	3.61	1.34	7.95	4.56	3.05	0.00	0.00	8.70	6.41
2105C	0.00	0.00	7.52	31.36	28.16	8.37	5.70	10.70	0.00	0.00	0.00	2.64	4.56	1.03	4.23	2.13	2.01	2.93	2.77	5.24	5.46
2107	0.00	0.00	6.81	4.00	19.45	34.68	0.00	16.34	0.00	10.79	0.00	2.23	3.60	2.15	17.96	11.75	4.96	0.00	0.00	11.15	5.19
2108	0.00	0.00	5.71	21.02	33.00	15.37	0.00	15.81	0.00	1.58	0.00	2.50	3.50	1.55	7.82	4.25	3.30	0.00	0.00	8.52	7.29
2109	0.00	0.00	5.12	20.97	35.30	14.23	0.00	16.67	0.00	0.23	0.00	2.51	3.52	1.48	7.25	3.95	3.03	0.00	0.00	9.03	7.64
2109A	0.00	0.00	6.71	30.13	25.53	14.84	3.57	11.63	0.00	0.00	0.00	2.41	3.97	1.23	7.58	4.28	2.98	2.11	1.47	6.59	5.05
2110	0.00	0.00	5.66	13.50	24.59	29.35	0.00	17.81	0.00	2.54	0.00	2.20	3.08	1.30	15.21	10.00	4.13	0.00	0.00	12.24	5.57
2110A	0.00	0.00	4.95	16.82	26.77	23.23	0.00	14.90	0.00	5.69	0.00	2.39	3.49	1.82	11.89	6.91	4.43	0.00	0.00	8.73	6.17
2111	0.00	0.00	8.71	25.37	24.72	17.62	10.92	6.77	0.00	0.00	0.00	2.12	2.36	1.44	9.06	5.52	3.04	7.05	3.88	4.21	2.56
2112	0.00	0.00	9.44	38.24	23.44	4.04	5.18	10.55	0.00	0.00	0.00	2.62	4.51	2.04	2.03	0.93	1.08	2.40	2.78	4.64	5.92
2113	0.00	0.00	9.67	11.58	24.56	27.42	0.00	13.61	0.00	6.30	0.00	2.42	3.67	0.79	14.05	8.26	5.10	0.00	0.00	8.10	5.51
2113A	0.00	0.00	5.65	24.44	23.92	12.10	10.56	17.33	0.00	0.00	0.00	2.45	3.02	0.55	6.27	4.10	1.74	7.42	3.14	11.81	5.52
2114	0.00	0.00	4.84	20.03	34.89	14.73	0.00	16.70	0.00	2.22	0.00	2.33	3.30	0.98	7.53	4.33	2.86	0.00	0.00	9.66	7.04
2114A	0.71	0.00	8.41	30.50	30.08	4.98	18.93	0.00	0.00	0.00	0.00	2.24	3.30	0.86	2.53	1.33	1.13	10.24	8.69	0.00	0.00
2119	0.73	0.00	10.41	32.14	25.78	7.34	16.53	0.00	0.00	0.00	0.00	2.31	3.50	1.30	3.71	1.85	1.78	8.42	8.11	0.00	0.00
2121	0.00	0.00	5.27	13.88	26.80	23.63	0.00	19.80	0.00	3.22	0.00	2.46	3.66	1.32	12.20	7.69	3.75	0.00	0.00	12.87	6.93
2122	0.00	0.00	4.59	0.00	21.77	37.10	0.00	16.37	0.19	12.33	0.00	2.20	3.00	2.51	19.21	12.50	5.39	0.00	0.00	11.10	5.27
2124	0.00	0.00	4.98	23.69	32.56	16.33	0.00	15.20	0.00	0.58	0.00	2.38	2.69	1.63	8.30	4.47	3.56	0.00	0.00	8.09	7.11
2124A	0.00	0.00	4.16	18.99	30.32	21.31	0.00	17.80	0.00	1.33	0.00	2.32	2.48	1.31	10.96	6.67	3.68	0.00	0.00	11.07	6.73
2124B	0.00	0.00	4.29	21.03	34.22	15.62	0.00	17.24	0.00	0.90	0.00	2.41	2.78	1.55	7.97	4.48	3.16	0.00	0.00	9.70	7.54
2124C	0.00	0.00	4.90	23.81	33.32	14.60	0.00	16.34	0.00	0.22	0.00	2.42	2.71	1.72	7.43	4.06	3.11	0.00	0.00	8.87	7.47
2124D	0.00	0.00	4.36	23.87	32.55	15.24	0.00	16.02	0.00	1.19	0.00	2.39	2.69	1.75	7.76	4.26	3.22	0.00	0.00	8.75	7.27
2124E	0.00	0.00	7.88	22.99	25.27	18.34	16.64	3.59	0.00	0.00	0.00	2.11	2.13	1.08	9.45	5.87	3.02	10.98	5.65	2.29	1.30
2124F	0.00	0.00	3.60	17.51	29.01	25.50	0.00	17.54	0.00	0.90	0.00	2.25	2.37	1.35	13.15	8.24	4.11	0.00	0.00	11.32	6.22
2125	0.00	0.00	4.92	0.00	23.33	35.81	0.00	17.19	1.25	10.34	0.00	2.17	2.86	2.18	18.55	12.14	5.11	0.00	0.00	11.74	5.45
2126	0.00	0.00	9.33	32.59	28.11	8.76	0.75	12.77	0.00	0.00	0.00	2.32	4.33	1.06	4.45	2.36	1.96	0.41	0.34	6.67	6.10
2126A	0.00	0.00	5.62	10.23	30.12	21.80	0.00	20.39	0.00	4.02	0.00	2.42	3.90	1.53	11.25	7.08	3.47	0.00	0.00	13.24	7.15
2127	0.00	0.00	9.18	31.27	28.66	7.44	8.64	7.31	0.00	0.00	0.00	2.37	4.13	1.03	3.77	1.96	1.71	4.61	4.03	3.72	3.59
2128	0.00	0.00	5.54	18.50	24.55	27.69	0.00	15.29	0.00	2.36	0.00	2.25	2.90	0.94	14.28	8.96	4.45	0.00	0.00	9.88	5.41
2131	0.00	0.00	7.72	14.26	24.37	31.18	0.00	7.51	0.00	7.93	0.00	2.22	3.60	1.24	15.88	8.71	6.59	0.00	0.00	4.09	3.41
2132	0.00	0.00	8.70	28.52	27.48	12.68	1.62	12.75	0.00	0.00	0.00	2.49	4.51	1.28	6.45	3.47	2.77	0.90	0.72	6.79	5.96

2132A	0.00	0.00	9.93	23.72	20.26	13.13	14.36	12.70	0.00	0.00	0.00	2.30	2.67	0.97	6.81	4.49	1.83	10.20	4.16	8.76	3.94
2133	0.00	0.00	9.51	32.71	26.96	11.64	2.53	9.37	0.00	0.00	0.00	2.30	3.93	1.07	5.88	2.94	2.81	1.30	1.24	4.56	4.81
2134	0.00	0.00	8.74	12.89	21.88	26.96	0.00	15.99	0.00	5.27	0.00	2.49	4.48	1.35	13.88	8.56	4.51	0.00	0.00	10.11	5.87
2135	0.38	0.00	12.19	29.19	20.46	16.69	15.64	0.00	0.00	0.00	0.00	1.98	2.32	1.17	8.57	5.12	3.01	9.85	5.79	0.00	0.00
2135A	0.00	0.00	6.06	4.24	22.81	34.62	0.00	16.89	0.00	8.44	0.00	2.25	2.71	2.03	17.91	11.58	5.13	0.00	0.00	11.35	5.54
2135B	0.00	0.00	6.61	17.12	29.76	16.22	0.00	16.53	0.00	4.54	0.00	2.70	4.86	1.70	8.26	4.48	3.48	0.00	0.00	8.91	7.62
2136	0.00	0.00	3.13	4.27	23.73	35.92	0.00	17.02	0.00	8.76	0.00	2.29	2.81	2.13	18.59	12.04	5.29	0.00	0.00	11.46	5.56
2136A	5.24	0.00	15.58	32.00	17.52	12.46	12.48	0.00	0.00	0.00	0.00	1.78	2.00	0.97	6.37	3.67	2.41	7.53	4.95	0.00	0.00
2201	0.00	0.00	12.43	32.65	19.99	8.22	0.00	15.54	0.00	3.24	0.00	2.48	3.92	1.57	4.19	2.29	1.74	0.00	0.00	8.48	7.06
2203	0.00	0.00	11.41	22.49	20.13	18.51	0.00	14.49	0.00	6.45	0.00	2.48	4.05	0.00	9.48	5.53	3.50	0.00	0.00	8.54	5.95
2204	0.00	0.00	11.23	23.66	17.83	20.24	0.00	13.71	0.00	6.44	0.00	2.54	4.37	0.00	10.37	6.08	3.79	0.00	0.00	8.13	5.58
2207	0.00	0.00	9.92	36.91	23.63	3.96	11.14	5.61	0.00	0.00	0.00	2.57	4.25	2.07	1.99	0.90	1.07	5.08	6.05	2.43	3.18
2209	0.00	0.00	8.98	39.50	22.82	5.87	0.71	13.58	0.00	0.00	0.00	2.60	4.28	1.72	2.96	1.44	1.46	0.35	0.36	6.41	7.16
2209A	0.00	0.00	9.10	37.89	23.62	5.07	3.72	12.03	0.00	0.00	0.00	2.58	4.21	1.81	2.56	1.24	1.28	1.84	1.89	5.64	6.39
2212	0.00	0.00	13.03	27.88	22.70	7.20	0.00	17.30	0.00	3.13	0.00	2.53	4.33	1.95	3.66	1.98	1.56	0.00	0.00	9.24	8.05
2213	0.00	0.00	8.97	17.48	22.49	15.35	0.00	20.72	0.00	6.82	0.00	2.38	3.83	2.01	7.92	4.96	2.47	0.00	0.00	13.38	7.34
2217	0.00	0.00	9.45	37.82	23.70	4.67	6.19	9.21	0.00	0.00	0.00	2.61	4.43	1.98	2.34	1.04	1.29	2.77	3.42	3.90	5.30
2217A	5.68	0.00	13.43	31.92	21.92	7.02	14.24	0.00	0.00	0.00	0.00	1.95	3.08	0.77	3.58	1.98	1.46	8.20	6.04	0.00	0.00
2217B	0.00	0.00	4.49	19.65	22.30	20.62	3.23	24.62	0.00	0.00	0.00	2.32	2.25	0.53	10.73	7.29	2.60	2.38	0.85	17.66	6.95
2218	7.65	0.00	15.85	31.84	16.06	11.54	11.69	0.00	0.00	0.00	0.00	1.79	2.64	0.97	5.91	3.43	2.20	7.12	4.57	0.00	0.00
2219	0.00	0.00	6.86	21.20	22.15	16.78	8.34	19.50	0.00	0.00	0.00	2.15	2.34	0.69	8.74	6.02	2.02	6.25	2.10	14.24	5.26
2220	0.00	0.00	5.27	12.19	29.47	24.65	0.00	16.61	0.00	5.34	0.00	2.27	3.37	0.85	12.72	7.97	3.97	0.00	0.00	10.73	5.89
2221	11.91	0.00	12.19	37.86	20.11	5.16	8.29	0.00	0.00	0.00	0.00	1.62	2.46	0.41	2.60	1.26	1.31	4.06	4.23	0.00	0.00
2222A	11.60	0.00	12.84	33.76	23.21	1.92	12.15	0.00	0.00	0.00	0.00	1.62	2.49	0.43	0.98	0.54	0.40	6.95	5.20	0.00	0.00
2223	0.00	0.00	9.15	37.96	22.77	6.92	4.75	10.50	0.00	0.00	0.00	2.57	3.99	1.43	3.49	1.74	1.68	2.42	2.33	5.09	5.41
2223A	0.00	0.00	14.49	35.03	20.85	4.45	0.00	15.64	0.00	1.20	0.00	2.44	4.07	1.87	2.26	1.17	1.02	0.00	0.00	7.97	7.67
2226	0.00	0.00	7.43	33.07	25.07	9.27	0.00	14.81	0.00	2.22	0.00	2.63	4.32	1.20	4.69	2.37	2.21	0.00	0.00	7.30	7.51
2230	0.00	0.00	7.24	17.10	28.49	19.96	0.00	15.30	0.00	4.24	0.00	2.35	3.42	1.94	10.22	5.92	3.82	0.00	0.00	8.94	6.36
2232	0.00	0.00	10.67	30.39	23.60	13.67	0.00	11.36	0.00	2.82	0.00	2.33	3.79	1.41	6.93	3.63	3.10	0.00	0.00	5.85	5.51
2233	15.19	0.00	14.71	33.89	21.37	0.75	10.27	0.00	0.00	0.00	0.00	1.54	1.91	0.39	0.38	0.18	0.19	5.07	5.20	0.00	0.00
2233A	0.00	0.00	3.14	19.17	29.52	20.90	0.00	14.11	0.00	6.54	0.00	2.33	3.28	1.05	10.70	6.23	3.98	0.00	0.00	8.28	5.83
2233B	18.58	0.31	17.63	36.07	16.74	0.00	7.71	0.00	0.00	0.00	0.00	1.27	1.37	0.34	0.00	0.00	0.00	3.62	4.09	0.00	0.00
2234	0.00	0.00	11.55	32.90	21.05	11.29	8.65	7.36	0.00	0.00	0.00	2.30	3.89	1.04	5.78	3.34	2.17	5.25	3.41	4.29	3.07
2235	6.02	0.00	10.15	33.80	27.25	2.08	15.56	0.00	0.00	0.00	0.00	1.85	2.87	0.44	1.06	0.57	0.46	8.63	6.93	0.00	0.00
2302	0.00	0.00	13.04	28.79	18.54	9.27	0.00	16.27	0.00	5.61	0.00	2.47	4.33	1.75	4.73	2.65	1.89	0.00	0.00	9.10	7.17
2304	0.00	0.00	5.84	31.73	30.96	6.39	6.02	11.97	0.00	0.00	0.00	2.39	3.14	1.59	3.24	1.59	1.45	3.24	2.78	6.15	5.83
2307	0.00	0.00	9.99	38.92	23.62	4.90	15.72	0.38	0.00	0.00	0.00	2.23	2.91	1.36	2.48	1.21	1.22	7.85	7.87	0.18	0.20
2307A	0.00	0.00	5.99	31.12	29.83	8.83	0.00	16.08	0.00	0.50	0.00	2.56	3.85	1.26	4.48	2.38	1.97	0.00	0.00	8.41	7.67
2309	0.00	0.00	5.91	19.67	24.25	17.33	0.00	22.61	0.00	2.63	0.00	2.56	4.26	0.81	8.97	5.78	2.58	0.00	0.00	15.15	7.46

TABLE 4. CIPW NORMATIVE COMPOSITIONS, SOUTHWEST MAP AREA--Continued

Sample No.	Q	C	or	ab	an	di	hy	ol	lc	ne	cs	mt	il	ap	di			hy		ol	
															wo	en	fs	en	fs	fo	fa
2309A	0.00	0.00	11.09	31.67	22.81	8.26	0.00	17.59	0.00	1.03	0.00	2.41	3.82	1.36	4.22	2.42	1.62	0.00	0.00	10.13	7.46
2311	0.00	0.00	13.72	34.76	14.06	16.18	0.51	13.67	0.00	0.00	0.00	2.14	3.72	1.27	8.36	5.29	2.54	0.35	0.17	8.95	4.73
2313	0.00	0.00	13.85	32.89	20.72	4.27	0.00	15.88	0.00	3.86	0.00	2.53	4.16	1.88	2.16	1.08	1.03	0.00	0.00	7.74	8.14
2316	0.00	0.00	8.86	28.41	22.55	13.76	0.00	16.73	0.00	2.61	0.00	2.32	3.50	1.29	7.07	4.30	2.38	0.00	0.00	10.39	6.34
2317	0.00	0.00	11.51	29.24	23.16	8.89	0.00	18.04	0.00	1.14	0.00	2.44	3.93	1.68	4.55	2.64	1.70	0.00	0.00	10.55	7.49
2317A	0.00	0.00	11.14	28.79	26.08	5.96	2.75	17.22	0.00	0.00	0.00	2.41	4.01	1.69	3.05	1.79	1.12	1.69	1.06	10.20	7.02
2318	0.00	0.00	12.15	28.45	20.57	7.49	0.00	17.69	0.00	5.02	0.00	2.60	4.27	1.80	3.81	2.10	1.57	0.00	0.00	9.72	7.98
2319	0.00	0.00	8.17	31.17	26.55	10.66	10.84	7.30	0.00	0.00	0.00	2.02	2.47	0.84	5.49	3.37	1.80	7.06	3.77	4.59	2.71
2322	0.00	0.00	7.20	30.78	30.27	6.65	4.65	13.34	0.00	0.00	0.00	2.49	3.66	0.97	3.38	1.82	1.46	2.58	2.07	7.08	6.25
2323	0.00	0.00	5.59	30.83	31.64	4.87	14.62	5.12	0.00	0.00	0.00	2.57	3.58	1.21	2.46	1.18	1.24	7.16	7.47	2.38	2.74
2325	0.00	0.00	4.83	31.25	35.60	1.18	6.96	12.83	0.00	0.00	0.00	2.58	3.58	1.22	0.60	0.29	0.30	3.42	3.55	5.98	6.85
2332	0.00	0.00	14.63	32.85	22.71	3.84	6.51	11.76	0.00	0.00	0.00	2.40	3.69	1.65	1.95	1.05	0.84	3.62	2.90	6.25	5.52
2332A	0.00	0.00	12.10	29.46	22.04	9.31	0.00	17.45	0.00	1.69	0.00	2.45	4.37	1.16	4.77	2.78	1.77	0.00	0.00	10.26	7.20
2332B	5.57	0.00	12.74	39.39	21.61	1.37	13.69	0.00	0.00	0.00	0.00	1.92	2.40	1.34	0.69	0.32	0.36	6.36	7.33	0.00	0.00
2333	0.00	0.00	6.39	30.52	29.94	4.68	3.89	15.44	0.00	0.00	0.00	2.80	4.83	1.56	2.37	1.20	1.12	2.01	1.88	7.61	7.83
2334	0.00	0.00	7.87	30.66	27.49	6.51	0.00	16.95	0.00	2.03	0.00	2.55	4.26	1.72	3.31	1.75	1.46	0.00	0.00	8.82	8.14
2335	0.00	0.00	5.96	23.19	32.30	9.71	0.00	18.74	0.00	2.27	0.00	2.54	4.08	1.24	4.96	2.78	1.98	0.00	0.00	10.51	8.24
2335A	0.00	0.00	5.16	29.42	30.88	6.67	0.00	18.35	0.00	0.94	0.00	2.73	4.55	1.33	3.38	1.76	1.53	0.00	0.00	9.39	8.96
2430	0.00	0.00	12.40	28.93	22.12	6.31	0.00	18.28	0.00	3.43	0.00	2.56	4.35	1.67	3.22	1.79	1.30	0.00	0.00	10.15	8.13
2Z03	0.00	0.00	5.31	16.46	27.49	23.89	0.00	17.81	0.00	1.75	0.00	2.43	3.80	1.09	12.31	7.64	3.94	0.00	0.00	11.36	6.45
2Z03A	0.00	0.00	8.78	30.53	26.04	9.84	5.82	10.64	0.00	0.00	0.00	2.53	4.42	1.43	5.00	2.64	2.20	3.17	2.64	5.55	5.09
2Z13	0.00	0.00	4.54	18.10	29.69	19.12	0.00	18.88	0.00	2.76	0.00	2.49	3.57	0.86	9.82	5.92	3.38	0.00	0.00	11.60	7.28
2Z14	0.00	0.00	9.08	32.38	25.83	6.73	18.00	0.89	0.00	0.00	0.00	2.35	3.44	1.33	3.42	1.79	1.53	9.72	8.28	0.46	0.43
2Z14A	0.00	0.00	9.09	32.45	26.14	6.53	17.59	1.15	0.00	0.00	0.00	2.35	3.44	1.29	3.31	1.75	1.49	9.47	8.12	0.59	0.56
2Z15	0.00	0.00	4.54	17.19	28.95	19.77	0.00	19.90	0.00	2.98	0.00	2.46	3.40	0.82	10.17	6.24	3.35	0.00	0.00	12.50	7.40
2Z15A	0.00	0.00	7.51	17.89	31.41	17.02	0.00	15.36	0.00	3.30	0.00	2.44	3.14	1.99	8.67	4.74	3.61	0.00	0.00	8.35	7.01
2Z23	0.00	0.00	7.67	20.01	28.89	18.25	0.00	14.66	0.00	3.44	0.00	2.35	3.02	1.75	9.32	5.26	3.67	0.00	0.00	8.29	6.38
2Z23A	0.00	0.00	7.47	30.69	28.89	8.76	0.48	15.41	0.00	0.00	0.00	2.57	4.06	1.71	4.43	2.25	2.08	0.25	0.23	7.62	7.79
2Z24	0.00	0.00	7.69	15.62	29.67	19.88	0.00	13.98	0.00	5.69	0.00	2.39	3.11	2.02	10.12	5.49	4.28	0.00	0.00	7.52	6.46
2Z25	0.00	0.00	6.34	24.81	28.96	13.11	0.00	18.40	0.00	1.22	0.00	2.44	3.38	1.37	6.72	3.92	2.48	0.00	0.00	10.84	7.56
2Z25A	0.00	0.00	5.58	30.50	30.65	9.84	1.28	14.68	0.00	0.00	0.00	2.37	3.84	1.30	5.01	2.76	2.07	0.73	0.55	8.04	6.63
2Z25B	0.00	0.00	6.34	31.76	28.65	7.55	6.35	10.98	0.00	0.00	0.00	2.55	4.00	1.87	3.82	1.95	1.78	3.32	3.03	5.47	5.51
2Z25C	0.00	0.00	5.33	30.54	30.35	3.50	3.17	14.07	0.00	0.00	0.00	2.39	3.82	1.21	4.39	2.46	1.75	1.85	1.31	7.90	6.18
2Z25D	0.00	0.00	6.18	20.45	23.63	22.82	0.00	18.97	0.00	1.10	0.00	2.38	3.53	0.97	11.79	7.49	3.54	0.00	0.00	12.47	6.50

2Z26	0.00	0.00	6.97	18.29	20.66	22.82	0.00	19.24	0.00	3.28	0.00	2.64	4.69	1.45	11.76	7.29	3.77	0.00	0.00	12.26	6.98
2Z27A	0.00	0.00	9.01	32.98	25.37	9.88	4.46	10.98	0.00	0.00	0.00	2.36	3.52	1.48	5.02	2.66	2.21	2.43	2.02	5.74	5.25
2Z28	0.00	0.00	6.31	25.23	29.41	13.76	0.37	17.33	0.00	0.00	0.00	2.52	3.73	1.37	7.03	3.98	2.75	0.22	0.15	9.83	7.50
3113	0.00	0.00	6.06	20.93	29.05	17.86	0.00	18.56	0.00	1.51	0.00	2.28	2.80	0.99	9.20	5.67	2.99	0.00	0.00	11.74	6.82
3117	0.00	0.00	4.34	17.99	28.89	23.40	0.00	17.60	0.00	1.43	0.00	2.29	2.93	1.16	12.06	7.52	3.82	0.00	0.00	11.29	6.32
3120	0.00	0.00	5.19	5.43	26.64	33.66	0.00	14.72	0.00	7.77	0.00	2.21	2.54	1.89	17.35	10.82	5.49	0.00	0.00	9.44	5.28
3121	0.00	0.00	5.48	10.99	29.65	26.26	0.00	15.17	0.00	5.35	0.00	2.36	3.21	1.57	13.46	7.95	4.84	0.00	0.00	9.08	6.09
3121A	0.00	0.00	6.27	19.77	20.53	19.85	4.79	23.35	0.00	0.00	0.00	2.16	2.01	1.29	10.34	7.12	2.39	3.59	1.21	17.04	6.31
3121B	0.00	0.00	6.68	29.21	31.27	9.84	1.25	14.32	0.00	0.00	0.00	2.41	3.40	1.66	5.00	2.64	2.21	0.68	0.57	7.46	6.86
3126	0.00	0.00	4.77	15.88	22.88	30.87	0.00	17.76	0.00	2.27	0.00	2.12	2.23	1.24	16.01	10.60	4.26	0.00	0.00	12.31	5.45
3134	0.00	0.00	3.92	16.89	34.09	21.18	0.00	14.38	0.00	3.09	0.00	2.37	2.58	1.55	10.78	5.90	4.49	0.00	0.00	7.82	6.56
3134A	0.00	0.00	7.98	29.73	28.51	5.85	9.91	8.72	0.00	0.00	0.00	2.74	5.19	1.42	2.95	1.47	1.43	5.02	4.89	4.21	4.51
3134B	0.00	0.00	7.50	25.15	24.79	13.28	0.00	19.49	0.00	1.12	0.00	2.58	4.77	1.36	6.82	4.08	2.38	0.00	0.00	11.85	7.64
3135	0.00	0.00	5.58	24.67	31.84	14.02	0.00	16.35	0.00	0.37	0.00	2.55	3.72	0.94	7.10	3.66	3.26	0.00	0.00	8.25	8.10
3135A	0.00	0.00	4.99	22.27	33.72	14.31	0.00	17.02	0.00	0.77	0.00	2.50	3.58	0.87	7.30	4.07	2.95	0.00	0.00	9.47	7.56
3136	0.00	0.00	3.30	14.78	33.89	21.87	0.00	16.02	0.00	3.88	0.00	2.39	2.35	1.57	11.16	6.28	4.42	0.00	0.00	9.02	7.00
3201	0.00	0.00	7.29	32.07	29.36	7.15	5.73	11.51	0.00	0.00	0.00	2.50	3.49	0.93	3.62	1.87	1.66	3.04	2.69	5.83	5.68
3211	0.00	0.00	5.40	19.78	24.73	21.90	0.00	18.82	0.00	2.80	0.00	2.26	2.95	1.39	11.31	7.17	3.42	0.00	0.00	12.34	6.48
3212	0.00	0.00	4.58	23.66	31.31	13.38	0.00	18.13	0.00	2.12	0.00	2.49	3.44	0.91	6.85	3.97	2.56	0.00	0.00	10.61	7.52
3212A	0.00	0.00	6.98	26.63	25.64	14.80	0.00	18.23	0.00	0.14	0.00	2.48	3.99	1.13	7.60	4.54	2.67	0.00	0.00	11.06	7.17
3214	0.00	0.00	6.73	24.92	27.99	13.44	0.16	19.41	0.00	0.00	0.00	2.46	4.00	0.92	6.91	4.19	2.35	0.11	0.06	12.00	7.41
3215	0.00	0.00	7.13	24.48	25.35	10.81	4.32	20.83	0.00	0.00	0.00	2.40	3.55	1.16	5.59	3.61	1.61	2.99	1.33	13.97	6.86
3218	0.00	0.00	7.57	22.34	29.70	14.50	0.00	15.01	0.00	2.20	0.00	2.56	4.79	1.37	7.37	3.95	3.19	0.00	0.00	7.94	7.07
3221	0.00	0.00	6.93	26.76	27.44	15.40	1.65	15.92	0.00	0.00	0.00	2.22	2.77	0.94	7.92	4.81	2.67	1.06	0.59	9.88	6.04
3222	0.00	0.00	2.95	21.29	25.18	21.19	0.00	22.30	0.00	1.23	0.00	2.28	2.62	0.99	10.99	7.28	2.92	0.00	0.00	15.46	6.84
3223	0.00	0.00	7.14	32.41	25.66	7.03	0.00	16.32	0.00	1.14	0.00	2.91	6.01	1.43	3.55	1.79	1.69	0.00	0.00	8.01	8.31
3226	0.00	0.00	6.74	21.16	23.74	16.28	0.00	21.11	0.00	3.89	0.00	2.41	3.36	1.35	8.40	5.27	2.61	0.00	0.00	13.65	7.46
3226A	0.00	0.00	0.41	15.76	38.76	25.19	1.91	15.10	0.00	0.00	0.00	1.60	1.27	0.00	13.13	9.07	3.00	1.43	0.47	11.07	4.03
3226B	0.00	0.00	0.65	18.03	26.47	25.01	10.77	14.83	0.00	0.00	0.00	2.40	1.78	0.07	12.95	8.45	3.60	7.55	3.22	10.09	4.74
3226C	0.00	0.22	0.06	0.00	0.37	0.00	5.07	91.42	0.00	0.00	0.00	2.66	0.10	0.07	0.00	0.00	0.00	4.36	0.71	77.55	13.87
3226D	0.00	0.00	0.12	3.22	9.73	41.06	0.00	40.21	0.00	1.55	0.00	1.89	1.19	0.02	21.67	16.65	2.74	0.00	0.00	34.03	6.17
3226E	0.00	0.00	0.00	0.00	6.82	65.59	0.00	22.42	0.05	2.46	0.22	1.35	0.50	0.00	34.70	27.14	3.75	0.00	0.00	19.46	2.96
3226F	0.00	0.00	0.18	4.16	7.39	52.35	0.00	30.85	0.00	1.37	0.00	1.82	0.83	0.10	27.61	21.05	3.69	0.00	0.00	25.85	4.99
3226G	0.00	0.00	0.12	6.10	15.07	36.21	0.00	36.36	0.00	0.49	0.00	2.68	2.24	0.02	18.93	13.42	3.86	0.00	0.00	27.61	8.75
3226H	0.00	0.00	0.54	4.50	13.86	48.25	0.00	26.31	0.00	2.23	0.00	2.13	1.74	0.00	25.30	18.44	4.51	0.00	0.00	20.72	5.59
3226J	0.00	0.00	7.83	19.30	20.30	22.02	0.00	18.76	0.00	5.43	0.00	2.50	3.87	0.00	11.37	7.18	3.48	0.00	0.00	12.22	6.53
3226K	0.00	0.20	0.00	0.00	0.00	0.00	3.34	93.40	0.00	0.00	0.00	2.90	0.12	0.01	0.00	0.00	0.00	2.83	0.52	77.81	15.60
3226L	0.00	0.00	0.00	7.19	17.78	37.25	0.85	32.81	0.00	0.00	0.00	2.33	1.79	0.00	19.50	14.03	3.72	0.67	0.18	25.39	7.42
3226M	0.00	0.00	0.00	0.00	10.48	67.22	0.00	15.12	0.00	4.10	0.56	1.57	0.95	0.00	35.38	26.57	5.28	0.00	0.00	12.40	2.71

TABLE 4. CIPW NORMATIVE COMPOSITIONS, SOUTHWEST MAP AREA--Continued

Sample No.	Q	C	or	ab	an	di	hy	ol	lc	ne	cs	mt	il	ap	di			hy		ol	
															wo	en	fs	en	fs	fo	fa
32260	0.00	0.00	7.91	32.85	28.13	6.45	13.58	5.21	0.00	0.00	0.00	2.34	2.52	1.03	3.28	1.73	1.45	7.39	6.19	2.71	2.50
3226P	0.00	0.00	5.70	15.71	20.74	22.14	0.00	22.33	0.00	6.11	0.00	2.43	3.47	1.42	11.47	7.52	3.15	0.00	0.00	15.28	7.04
3228	0.00	0.00	6.02	18.66	24.19	16.95	0.00	23.64	0.00	3.52	0.00	2.37	3.43	1.27	8.78	5.76	2.40	0.00	0.00	16.20	7.44
3228A	0.00	0.00	7.72	28.36	31.55	8.29	3.63	13.77	0.00	0.00	0.00	2.34	3.19	1.18	4.23	2.32	1.75	2.07	1.56	7.53	6.24
3235	0.00	0.00	5.07	13.61	22.80	24.49	0.00	20.05	0.00	6.50	0.00	2.40	3.31	1.82	12.67	8.16	3.66	0.00	0.00	13.42	6.64
3236	0.00	0.00	7.65	22.88	24.33	14.69	0.00	18.71	0.00	3.80	0.00	2.42	3.72	1.85	7.56	4.65	2.48	0.00	0.00	11.79	6.92
3236A	0.00	0.00	13.55	36.36	17.35	7.72	0.00	14.19	0.00	3.06	0.00	2.47	3.86	1.47	3.92	2.07	1.73	0.00	0.00	7.41	6.79
3236B	0.00	0.00	7.59	21.29	24.83	16.30	0.00	18.93	0.00	3.20	0.00	2.43	3.74	1.72	8.39	5.18	2.73	0.00	0.00	11.97	6.96
3236C	0.00	0.00	14.81	31.76	20.07	5.75	0.00	16.12	0.00	3.34	0.00	2.47	4.16	1.57	2.92	1.56	1.27	0.00	0.00	8.48	7.64
3301	0.00	0.00	7.49	33.83	26.04	6.79	0.00	15.94	0.00	0.22	0.00	2.73	5.45	1.55	3.44	1.76	1.59	0.00	0.00	7.97	7.97
3304	0.00	0.00	11.25	27.11	21.92	10.24	0.00	18.20	0.00	3.14	0.00	2.51	4.00	1.67	5.24	3.03	1.98	0.00	0.00	10.59	7.62
3305	0.00	0.00	7.10	32.30	26.93	9.64	2.58	13.06	0.00	0.00	0.00	2.59	4.51	1.32	4.90	2.59	2.16	1.41	1.17	6.81	6.25
3305A	0.00	0.00	6.70	32.15	30.86	6.52	0.00	15.91	0.00	0.62	0.00	2.42	3.87	0.98	3.31	1.76	1.44	0.00	0.00	8.36	7.54
3305B	0.00	0.00	9.94	24.78	22.09	11.77	0.00	19.35	0.00	3.71	0.00	2.51	4.52	1.37	6.05	3.66	2.06	0.00	0.00	11.95	7.40
3307	0.00	0.00	7.01	32.83	27.92	9.18	4.28	11.80	0.00	0.00	0.00	2.46	3.42	1.12	4.66	2.48	2.04	2.35	1.94	6.18	5.62
3311	0.00	0.00	5.03	23.63	32.28	13.54	8.78	10.93	0.00	0.00	0.00	2.28	2.68	0.88	6.95	4.14	2.46	5.51	3.27	6.61	4.33
3313	0.00	0.00	11.81	40.36	18.99	4.34	13.73	2.55	0.00	0.00	0.00	2.53	4.08	1.64	2.18	1.01	1.15	6.41	7.32	1.13	1.42
3319	0.00	0.00	6.48	20.49	24.06	14.62	0.00	21.70	0.00	4.40	0.00	2.67	4.42	1.19	7.53	4.64	2.45	0.00	0.00	13.71	7.98
3323	0.00	0.00	9.73	23.37	19.10	15.89	0.00	18.30	0.00	5.61	0.00	2.37	4.12	1.55	8.19	5.13	2.57	0.00	0.00	11.79	6.51
3324	0.00	0.00	9.92	23.82	21.86	12.46	0.00	19.55	0.00	4.43	0.00	2.33	4.03	1.63	6.43	4.03	2.00	0.00	0.00	12.64	6.91
3325	0.00	0.00	7.02	30.59	22.66	13.51	9.77	10.91	0.00	0.00	0.00	2.37	2.53	0.67	6.94	4.19	2.38	6.23	3.54	6.71	4.20
3326	0.00	0.00	2.61	18.08	36.08	13.61	17.49	6.46	0.00	0.00	0.00	2.49	2.46	0.74	6.97	4.03	2.62	10.61	6.89	3.77	2.70
3327	0.00	0.00	10.52	25.06	20.05	12.96	0.00	17.98	0.00	4.64	0.00	2.57	4.68	1.57	6.65	3.91	2.40	0.00	0.00	10.72	7.26
3331	0.00	0.00	13.55	34.13	20.02	6.55	0.00	15.20	0.00	2.59	0.00	2.49	3.97	1.53	3.33	1.77	1.46	0.00	0.00	7.96	7.24
3333	0.00	0.00	14.28	31.56	17.25	8.94	0.00	15.20	0.00	4.73	0.00	2.50	3.94	1.64	4.55	2.49	1.90	0.00	0.00	8.25	6.95
3333A	30.00	0.00	26.48	40.48	1.14	0.70	0.61	0.00	0.00	0.00	0.00	0.38	0.17	0.05	0.33	0.01	0.36	0.02	0.59	0.00	0.00
3335	27.41	0.00	24.59	40.50	4.90	0.00	1.97	0.00	0.00	0.00	0.00	0.42	0.14	0.07	0.00	0.00	0.00	0.61	1.36	0.00	0.00
3406	0.00	0.00	7.14	23.79	20.56	21.76	2.77	17.94	0.00	0.00	0.00	2.31	2.49	1.27	11.27	7.34	3.15	1.94	0.83	12.17	5.77
3407	0.00	0.00	11.53	41.31	18.39	4.16	14.87	1.89	0.00	0.00	0.00	2.46	3.92	1.50	2.09	0.99	1.07	7.14	7.74	0.86	1.03
3407A	0.00	0.00	6.38	29.48	24.77	12.42	0.00	19.54	0.00	0.64	0.00	2.52	3.24	1.03	6.37	3.76	2.30	0.00	0.00	11.67	7.87
3407B	69.43	2.27	7.95	10.00	4.34	0.00	3.63	0.00	0.00	0.00	0.00	1.36	0.83	0.19	0.00	0.00	0.00	1.70	1.93	0.00	0.00
3430	28.37	0.09	23.28	40.82	4.95	0.00	1.30	0.00	0.00	0.00	0.00	0.45	0.15	0.10	0.00	0.00	0.00	0.53	1.27	0.00	0.00
3Z13	0.00	0.00	9.54	30.45	23.80	9.75	0.05	18.64	0.00	0.00	0.00	2.40	4.06	1.35	5.01	3.05	1.68	0.03	0.02	11.59	7.05
3Z13A	0.00	0.00	6.44	10.67	26.73	27.04	0.00	14.56	0.00	7.30	0.00	2.32	2.91	2.08	13.87	8.22	4.96	0.00	0.00	8.74	5.81

3Z22	0.00	0.00	5.20	10.80	26.10	32.10	0.00	15.30	0.00	3.99	0.00	2.33	3.05	1.16	16.55	10.32	5.24	0.00	0.00	9.81	5.49
3Z26	0.00	0.00	8.25	30.26	27.17	10.26	0.53	15.04	0.00	0.00	0.00	2.54	4.59	1.40	5.22	2.80	2.24	0.30	0.24	7.98	7.05
3Z33	0.00	0.00	10.42	30.35	23.56	11.58	12.69	4.56	0.00	0.00	0.00	2.28	3.52	1.08	5.92	3.36	2.30	7.54	5.15	2.60	1.96
3Z36	0.00	0.00	9.49	37.01	22.98	6.37	10.23	6.07	0.00	0.00	0.00	2.46	3.68	1.76	3.22	1.59	1.57	5.15	5.08	2.91	3.16
3Z36A	0.00	0.00	9.00	31.19	27.70	10.13	2.57	12.11	0.00	0.00	0.00	2.39	3.90	1.03	5.15	2.73	2.26	1.41	1.17	6.34	5.78
4213	1.57	0.00	14.35	41.09	16.86	5.94	13.52	0.00	0.00	0.00	0.00	2.23	3.46	1.01	2.99	1.40	1.55	6.41	7.11	0.00	0.00
4214	0.00	0.00	7.22	34.24	25.42	8.90	7.82	9.14	0.00	0.00	0.00	2.43	3.39	1.48	4.52	2.44	1.94	4.36	3.46	4.87	4.26
4225	0.00	0.00	4.80	19.67	26.76	17.98	0.00	23.25	0.00	0.55	0.00	2.38	3.28	1.37	9.31	6.05	2.62	0.00	0.00	15.73	7.52
4226	0.00	0.00	4.53	20.64	29.10	14.99	0.00	20.75	0.00	2.14	0.00	2.50	3.66	1.74	7.70	4.66	2.63	0.00	0.00	12.79	7.95
4227	0.00	0.00	8.27	36.90	22.98	8.74	10.28	6.11	0.00	0.00	0.00	2.38	3.22	1.15	4.44	2.35	1.95	5.61	4.67	3.19	2.93
4234	0.00	0.00	7.54	25.99	29.41	12.46	0.00	15.61	0.00	0.35	0.00	2.60	4.81	1.27	6.34	3.44	2.68	0.00	0.00	8.40	7.21
4236	0.00	0.00	7.79	34.85	23.02	14.89	4.20	8.79	0.00	0.00	0.00	2.31	3.07	1.11	7.57	4.07	3.25	2.33	1.87	4.67	4.12
4236A	0.00	0.00	4.85	28.83	31.51	9.58	10.61	9.04	0.00	0.00	0.00	2.24	2.20	1.18	4.90	2.81	1.87	6.37	4.24	5.21	3.83
4301	6.96	0.00	18.35	29.97	12.04	18.54	9.65	0.00	0.00	0.00	0.00	1.50	1.62	1.42	9.59	6.19	2.76	6.67	2.97	0.00	0.00
4302	0.00	0.00	6.72	31.70	28.33	11.15	0.76	14.78	0.00	0.00	0.00	2.27	3.28	1.03	5.70	3.24	2.22	0.45	0.31	8.42	6.36
4302A	0.00	0.00	6.71	30.78	29.09	9.22	3.62	13.44	0.00	0.00	0.00	2.25	3.27	1.66	4.71	2.68	1.83	2.15	1.46	7.68	5.76
4303	0.00	0.00	5.49	27.24	28.15	11.65	3.95	16.38	0.00	0.00	0.00	2.54	3.64	0.98	5.97	3.49	2.19	2.43	1.53	9.68	6.70
4311	0.00	0.00	5.93	29.43	23.39	17.14	0.46	16.53	0.00	0.00	0.00	2.47	3.39	1.30	8.80	5.25	3.09	0.29	0.17	10.03	6.50
4313	0.00	0.00	4.40	23.77	29.37	18.86	5.24	12.55	0.00	0.00	0.00	2.37	2.56	0.91	9.68	5.76	3.42	3.29	1.95	7.59	4.96
4313A	0.00	0.00	4.21	23.33	29.24	19.18	2.87	15.48	0.00	0.00	0.00	2.36	2.59	0.77	9.85	5.92	3.41	1.82	1.05	9.47	6.01
4314	8.24	0.00	19.23	30.64	12.07	16.22	8.85	0.00	0.00	0.00	0.00	1.52	1.86	1.40	8.37	5.25	2.61	5.91	2.94	0.00	0.00
4315	0.00	0.00	3.93	15.38	31.44	21.88	0.00	17.92	0.00	2.66	0.00	2.41	2.49	1.96	11.22	6.63	4.03	0.00	0.00	10.73	7.19
4316	0.00	0.00	3.21	19.58	32.26	20.95	0.00	15.10	0.00	2.73	0.00	2.41	2.83	0.95	10.71	6.14	4.10	0.00	0.00	8.70	6.40
4319	0.00	0.00	6.11	26.06	26.05	15.12	0.00	16.91	0.00	1.91	0.00	2.50	4.10	1.27	7.75	4.57	2.80	0.00	0.00	10.09	6.82
4321	0.00	0.00	8.75	29.34	23.72	11.57	19.72	1.56	0.00	0.00	0.00	2.07	2.48	0.82	5.96	3.69	1.92	12.96	6.76	0.99	0.57
4322	0.00	0.00	7.53	13.59	25.77	20.33	0.00	18.93	0.00	5.74	0.00	2.54	4.27	1.33	10.46	6.38	3.49	0.00	0.00	11.81	7.12
4323	0.00	0.00	5.22	26.05	31.76	11.67	7.71	11.25	0.00	0.00	0.00	2.30	2.70	1.38	5.97	3.43	2.27	4.64	3.07	6.51	4.74
4323A	0.00	0.00	3.33	21.59	35.39	16.43	0.00	15.30	0.00	1.60	0.00	2.38	2.81	1.19	8.37	4.56	3.51	0.00	0.00	8.28	7.02
4324	0.00	0.00	5.90	26.56	25.51	16.07	0.00	19.24	0.00	0.17	0.00	2.43	3.31	0.84	8.28	5.16	2.62	0.00	0.00	12.34	6.91
4324A	0.00	0.00	6.36	22.67	23.62	15.14	11.71	15.29	0.00	0.00	0.00	2.21	2.29	0.75	7.86	5.26	2.02	8.46	3.24	10.75	4.54
4325	0.00	0.00	4.66	24.54	33.04	11.08	17.21	3.50	0.00	0.00	0.00	2.39	2.61	1.01	5.64	3.08	2.36	9.76	7.46	1.90	1.60
4326	0.00	0.00	7.18	13.11	25.92	21.82	0.00	18.45	0.00	5.52	0.00	2.51	4.25	1.29	11.23	6.89	3.70	0.00	0.00	11.58	6.86
4326A	0.00	0.00	3.67	23.31	35.87	14.62	0.00	16.52	0.00	0.09	0.00	2.31	2.72	0.90	7.48	4.28	2.87	0.00	0.00	9.50	7.02
4331	0.00	0.00	7.01	26.78	24.83	16.01	0.00	17.89	0.00	1.07	0.00	2.31	3.16	0.96	8.25	5.14	2.62	0.00	0.00	11.45	6.44
4332	0.00	0.00	5.39	19.94	32.55	10.41	10.59	15.12	0.00	0.00	0.00	2.46	2.80	0.76	5.37	3.34	1.71	7.00	3.59	9.66	5.46
4336	2.72	0.00	11.71	27.89	25.86	9.54	17.19	0.00	0.00	0.00	0.00	2.08	2.09	0.93	4.86	2.66	2.03	9.76	7.43	0.00	0.00
4406	0.00	0.00	6.34	15.96	27.47	21.96	0.00	16.39	0.00	4.52	0.00	2.38	3.21	1.82	11.27	6.70	3.99	0.00	0.00	9.89	6.50
4407A	0.00	0.00	5.41	19.72	29.00	20.25	0.00	17.49	0.00	1.26	0.00	2.39	3.42	1.07	10.41	6.34	3.50	0.00	0.00	10.87	6.62
4418	8.10	0.00	11.39	36.13	24.58	1.96	12.93	0.00	0.00	0.00	0.00	1.82	2.51	0.60	0.99	0.49	0.48	6.57	6.36	0.00	0.00

TABLE 4. CIPW NORMATIVE COMPOSITIONS, SOUTHWEST MAP AREA--Continued

Sample No.	Q	C	or	ab	an	di	hy	ol	lc	ne	cs	mt	il	ap	di			hy		ol	
															wo	en	fs	en	fs	fo	fa
4418A	2.87	0.00	10.71	30.08	24.69	7.58	18.22	0.00	0.00	0.00	0.00	2.09	3.04	0.74	3.88	2.24	1.46	11.03	7.19	0.00	0.00
4430	0.00	0.00	7.23	29.84	29.64	8.03	1.15	16.20	0.00	0.00	0.00	2.56	4.51	0.86	4.09	2.23	1.71	0.65	0.50	8.77	7.42
4431	8.72	0.00	16.77	28.61	16.89	11.43	12.86	0.00	0.00	0.00	0.00	1.81	1.95	1.00	5.87	3.50	2.07	8.08	4.78	0.00	0.00

TABLE 5. ANALYSES OF TRACE ELEMENTS IN PARTS PER MILLION, SOUTHWEST MAP AREA
[ND, not determined]

Sample No.	Ba	Rb	Sr	Zn	Zr	Y	Cd	Li	Co	Cr	Cu	Ga	Ni	Sc	V	Lab. No.	Analysts[1]	Remarks
1110	1790	ND	1100	ND	ND	ND	ND	ND	ND	ND	ND	ND	28	ND	ND	M129291	HE,LE,JT	Basalt, type i, vent 1110 flow.
1135	1970	ND	1180	ND	ND	ND	ND	ND	ND	ND	ND	ND	65	ND	ND	M129290	HE,LE,JT	Basalt, type g, vent 1123 flow.
1217D	1000	38	680	53	134	<5	ND	ND	13	58	12	25	21	10	120	M131533	MV,BK	Dacite, Bill Williams Mtn. dome.
1218C	740	51	540	76	205	15	ND	23	44	430	49	27	200	28	190	M131434	ML	Basaltic andesite, vent 1218, accessory clast.
1218D	710	88	295	38	142	<5	ND	ND	5	4	5	26	3	4	33	M131529	ML	Dacite, Bill Williams Mtn. central complex.
1218E	660	105	240	39	138	11	ND	ND	4	3	6	29	3	4	27	M131530	ML	Dacite, vent 1218 accessory clast.
1218F	670	8	800	99	133	10	ND	ND	37	110	49	46	66	43	520	M131528	ML	Basalt, type g, vent 1218.
1221A	90	ND	85	ND	ND	ND	ND	ND	ND	960	ND	ND	860	ND	ND	M129296	HE,LE,JT	Pyroxenite xenolith, Bill Williams Mountain.
1231A	2150	35	495	68	460	11	ND	ND	2	<2	5	36	2	3	<2	M131531	ML	Dacite, Hell Canyon plug dome.
1233	1100	16	890	<50	200	24	<2	<50	46	200	120	17	110	44	260	M131503	TF,VM	Basalt, type j, vent 1233.
1234A	1000	16	740	<50	190	21	<2	<50	57	820	96	17	350	38	230	M131385	TF,VM	Basalt, type a, vent 1233 dike.
1301A	1400	36	1500	64	300	26	<2	<50	11	<10	5	15	6	<10	45	M140267	TF,VM	Benmoreite, vent 1407 flow.
1321	1100	23	930	<50	230	26	<2	<50	47	390	95	18	150	42	280	M137114	TF,VM	Basalt, type b, flow.
1331	360	29	400	<50	180	22	<2	<50	46	370	53	18	170	32	210	M137119	TF,VM	Basalt, type f, vent 1331.
1418	1200	18	1300	<50	230	27	<2	<50	20	<10	13	16	8	13	100	M140266	TF,VM	Andesite, vent 1407 flow.
1419	830	22	830	<50	170	21	<2	<50	27	68	38	19	47	15	150	M136980	TF,VM	Do.
1419A	940	29	740	<50	180	21	<2	<50	35	380	60	18	140	23	190	M136981	TF,VM	Basalt, type d, vent 1419.
1419B	870	31	810	<50	180	21	<2	<50	26	51	38	18	36	15	140	M136985	TF,VM	Andesite, vent 1419 flow.
2113A	220	17	320	<50	170	20	<2	<50	52	500	92	16	300	30	190	M136954	TF,VM	Basalt, type f, flow.
2114A	659	23	ND	83	160	ND	ND	ND	34	26	ND	ND	ND	19	ND	M138316	LS	Basalt, type i, vent 2114A.
2121	1060	17	ND	90	97	ND	ND	ND	58	619	ND	ND	ND	34	ND	M138313	LS	Basalt, type b, vent 2127 flow.
2122	1800	<10	1300	<50	250	32	<2	<50	53	490	160	17	200	50	310	M136951	TF,VM	Basalt, type j, vent 2122.
2124C	1000	12	910	<50	200	25	<2	<50	44	37	60	19	58	37	280	M136944	TF,VM	Basalt, type i, vent 2124 dike.
2124E	980	22	690	<50	180	22	<2	<50	38	250	86	15	100	37	220	M136946	TF,VM	Basalt, type f, vent 2124 dike.
2124F	1100	12	740	<50	160	23	<2	<50	46	290	130	16	130	48	270	M136999	TF,VM	Basalt, type j, vent 2124B.
2135B	1500	16	940	51	200	30	<2	<50	48	63	50	20	77	35	300	M138227	TF,VM	Basalt, type i, flow.
2136A	1500	43	730	<50	220	23	<2	<50	28	130	48	17	55	22	170	M131386	TF,VM	Basaltic andesite, vent 2135.
2213	1100	52	570	<50	210	21	<2	<50	28	56	58	17	60	19	180	M136936	TF,VM	Basaltic andesite flow.
2223	680	22	960	69	240	26	<2	<50	34	46	27	20	37	21	160	M133151	TF,VM	Basalt, type e, vent 2222 flow.
2230	1780	22	ND	88	240	ND	ND	ND	43	93	ND	ND	ND	27	ND	M136998	LS	Basalt, type g, vent 2230 flow.

TABLE 5. ANALYSES OF TRACE ELEMENTS IN PARTS PER MILLION, SOUTHWEST MAP AREA--Continued

Sample No.	Ba	Rb	Sr	Zn	Zr	Y	Cd	Li	Co	Cr	Cu	Ga	Ni	Sc	V	Lab. No.	Analysts[1]	Remarks
2Z25B	550	20	830	57	180	23	<2	<50	38	71	46	19	57	23	220	M138286	TF,VM	Basalt, type h, vent 2Z25A dike.
2Z25D	410	18	570	<50	190	24	<2	<50	54	470	95	17	220	42	240	M138292	TF,VM	Basalt, type b, vent 2Z25 dike.
3226	560	19	880	92	167	20	2	21	60	520	60	31	180	38	190	M125977	REM,MV,BK,SN	Basalt, type d, vent 3226.
3226A	47	<5	530	44	22	<5	2	8	59	120	42	33	130	71	240	M125989	REM,MV,BK,SN	Gabbro xenolith, vent 3226.
3226B	45	<5	250	71	48	10	2	12	66	310	80	28	340	42	180	M125990	REM,MV,BK,SN	Gabbro xenolith, vent 3226.
3226C	8	8	<5	135	26	<5	2	11	120	80	12	<2	1800	<4	<2	M125991	REM,MV,BK,SN	Dunite xenolith, vent 3226.
3226D	20	10	58	50	35	<5	3	5	100	2600	96	<2	850	41	140	M125992	REM,MV,BK,SN	Peridotite xenolith, vent 3226.
3226E	15	<5	45	38	21	<5	2	3	82	2000	35	8	600	110	230	M125994	REM,MV,BK,SN	Do.
3226F	54	13	133	54	46	<5	2	7	110	3200	120	17	820	69	190	M125995	REM,MV,BK,SN	Do.
3226G	30	12	64	71	58	<5	2	5	110	2000	28	19	630	42	180	M125996	REM,MV,BK,SN	Do.
3226H	52	9	109	47	57	<5	3	6	100	1500	48	18	440	72	210	M125997	REM,MV,BK,SN	Pyroxenite xenolith, vent 3226.
3226K	18	<5	<5	129	20	21	ND	<2	210	180	63	8	1800	6	230	M131435	ML	Dunite xenolith, vent 3226.
3226L	17	<5	46	71	46	<5	ND	<2	100	4200	23	22	470	78	340	M131436	ML	Pyroxenite xenolith, vent 3226.
3226M	12	<5	50	31	42	<5	ND	<2	83	3300	76	16	310	100	380	M131437	ML	Do.
3226O	860	17	ND	79	180	ND	ND	ND	34	12	ND	ND	ND	17	ND	M133165	LS	Basalt, type h, vent 3226A flow.
3407	580	18	950	93	220	20	ND	18	19	37	56	24	33	11	96	M133186	LE,ML	Basalt, type e, vent 3407 dike.
3407A	440	<6	600	57	163	<8	ND	12	52	300	52	36	190	38	82	M133187	LE,ML	Basalt, type d, vent 3407 dike.
3407B	370	44	70	<5	350	<8	ND	26	6	47	15	10	19	5	35	M133188	LE,ML	Metasandstone xenolith, vent 3407.
3430	1050	49	215	44	46	<5	ND	ND	2	<2	2	19	2	<1	5	M129342	MV,BK	Rhyolite, Sitgreaves Mountain.
4314	1400	33	670	<50	220	20	<2	<50	25	200	56	16	68	21	160	M133183	TF,VM	Basaltic andesite, vent 4301 flow.
4406	1200	14	1200	<50	170	25	<2	<50	47	240	100	19	110	39	300	M136962	TF,VM	Basalt, type b, vent 4301 flow.

[1]Analysts:

BK = Bi-Shia King
HE = H. Neil Elsheimer
JT = J. Tillman
LE = L. Espos
LS = L. J. Schwarz
ML = Michael Leong
MV = M. Villarreal
REM = R. E. Mays
SN = Sarah Neil
TF = T. L. Fries
VM = V. McDaniel