OPEN–FILE REPORT 02–099
PLATE 1

Santa Cruz Valley Geologic Map

DESCRIPTION OF MAP UNITS

(Radiometric dates presented herein cover primary rock ages)
All units may not appear on map

Qg YOUNGER SURFICIAL DEPOSITS (HOLOCENE AND PLEISTOCENE)-Gravel, sand and silt (Holocene and Pleistocene)-Alluvium pediment; includes some colluvium and soils. Deposits moxly light-gray, unidurated and of poorly rounded and locally-derived clasts, except along larger valley-center river. Mostly several meters thick but as much as a hundred meters thick

Qd Sand and silt (Holocene)-Eolian deposits, mainly of dunes but including beach ridges reworked into dunes. Unit is probably as much as several meters thick in most places

Qp Gravel, sand, silt amd clay (Pleistocene)-Pluvial lake deposits, including beach gravel in low ridges. Deposits well sorted and mostly unconsolidated; gravel well rounded. Thickness unknown.

QTg GRAVEL, SAND AND CONGLOMERATE (HOLOCENE TO MIOCENE)-Alluvium filling intermontane basins, on pediments, in alluvial aprons and stream terraces and along watercourses

QTgu Gravel, sand and silt (Holocene to Miocene)-Alluvium of floodplains, terraces, pediments and basins, undifferentiated. Commonly a few tens of meters thick to hundreds of meters thick

QTb BASALT (PLEISTOCENE TO MIOCENE)-Lava flows and cinder deposits

Tuc Upper conglomerate, gravel and sand (Pliocene and Miocene)-Alluvium; mainly deposits rich in volcanic fragments derived from underlying or nearby rhyolite rocks. Thickness several tens of meters to hundreds of meters.

Tb UPPER IGNEOUS AND SEDIMENTARY ROCKS (UPPER MIOCENE TO EOCENE?)-Basalt (Miocene):-Lava flows, pyroclastic rocks and some dikes and intercalated gravel, of andesitic basalt. Mostly about 1 meter to several meters thick. Includes a younger group radiometrically dated at 13 and 14 m.y. old, and an older group dated at 20, 23, 24, 25 and 25 m.y.

Tc Conglomerate (Miocene to Eocene?)-Mostly reddish-gray poorly indurated to moderatately indurated rock with subrounded clasts; locally includes some landslide deposits and some bodies of tuff and coarsely porphyritic andesite too small to be mapped separately. Commonly several tens to hundreds of meters thick

Tsv SEDIMENTARY AND VOLCANIC ROCKS, UNDIVIDED (MIOCENE TO EOCENE)-Rhyolitic to andesitic lava and tuff, and some interbedded conglomerate, sandstone and shale

Tr RHYOLITIC ROCKS (MIOCENE TO OLIGOCENE)-Includes lava flows, tuffs and tuffaceous sandstone

Trt RHYOLITIC TUFFS (MIOCENE AND OLIGOCENE)-Airfall tuff, ashflow tuff, tuff breccia, welded tuff and some sedimentary rocks

Trf RHYOLITIC LAVA FLOWS (MIOCENE AND OLIGOCENE)-May include some intrusive bodies

?INTRUSIVE ROCKS (MIOCENE TO OLIGOCENE)

Tri RHYOLITE (MIOCENE AND OLIGOCENE)-Dikes and plugs

Tg GRANITE (OLIGOCENE)- Stocks

Tva Extrusive andesite and dacite (Miocene and Upper Oligocene)-Lava flows, pyroclastic rocks, some intercalalated epiclastic rocks and dikes. Mostly gray, fine-grained, porphyritic rocks; includes some very coarse feldspar porphyry andesite (Turkey track porphyry, an informal term of Cooper, 1961). Thickness mostly several meters to several tens of meters. Dated at 24, 25, 27, 33 and 39 m.y.

Tv Extrusive rhyolite and rhyodacite (Miocene and Upper Oligocene)-Lava flows, welded tuff, pyroclastic rocks and some intercalated epiclastic rocks. Light-gray to grayish-pink, vitric to fine-grained, porphyritic. Commonly a few tens of meters to a few thousands of meters thick. Dated at 23, 24, 25, 26, 26, 26, 26 and 27 m.y., if substantiated, may indicate the presence of Eocene rocks in the lower member of the S O Volcanics of Cochise Co.

Tug Granitoid rocks (Miocene and Upper Oligocene)-Granite(?), quartz monzonite and granodiorite in stocks and small intrusive bodies. Dated at 22(?), 26, 28, 29, 30, 31, 31 and 33 m.y.

Ti Intrusive rhyolite and rhyodacite (Upper Oligocene)-Plugs, laccoliths and dikes; probably genetically related to volcanic rocks nearby. Mostly gray to pink, vitric to fine-grained, porphyritic, massive to flow-laminated. Dated at 24, 25, 26, 26, 25, 27 adnd 29 m.y.

Ta ANDESITIC ROCKS (OLIGOCENE)-Lava flows, breccia deposits and interbedded sedimentary rocks

Tlc Lower conglomerate, gravel and sand (Oligocene and Eocene?)-Alluvium; commonly grayish-red deposits of small, well rounded, nonvolcanic clasts. Mostly several meters to a few tens of meters thick

Tlp Quartz latite porphyry-Plugs, breccia pipes and dikes. In many places associated with mineralization. Dated at 56, 56 and 56 m.y.

Tlv UPPER CORDILLERAN (LARAMIDE) IGNEAOUS ROCKS (LOWER PALEOCENE)-Lower volcanic rocks-Rhyolite to andesite lava flows, pyroclastic rocks and some intercalated epiclastic rocks. Dated at 57 m.y. Possibly younger age to east

Tlg Lower graitoid rocks-Granodiorite and quartz monzonite stocks. Locally associated with mineralization. Dated at 58, 58, 59, 59, 60, 62 and 64 m.y.

TKg INTRUSIVE ROCKS (EOCENE TO LATE CRETACEOUS)-Mainly Eocene to Late Cretaceous granite, monzonite, granodiorite and diorite; some Oligocene to Late Cretaceous peraluminous (two-mica and garnet-bearing) granite. Includes Copper Creek Granodiorite

TKvs VOLCANIC AND SEDIMENTARY ROCKS (EOCENE TO UPPER CRETACEOUS)-Andesitic lava flows and breccia sheets, rhyolitic tuff and welded tuff and volcaniclastic sedimentary rocks

TKa ANDESITE (EOCENE TO LATE CRETACEOUS)-Plugs, dikes and stocks

TKr RHYOLITE (EOCENE TO LATE CRETACEOUS)-Plugs and dikes

TKp MAIN CORDILLERAN (LARAMIDE) IGNEOUS ROCKS-Porphyritic and aplitic intrusive rocks (Paleocene and Upper Cretaceous)-Mostly latite porphyry to dacite porphyry in small stocks and plugs and aplitic bodies not associated with other granitoid stocks. Dated ar 61, 63, 63, 64 and 65 m.y.

Kd Dionte and quartz diorite (Upper Cretaceous)-Stocks of dark-gray fine- to medium-grained rocks. Locally assiciated with mineralization. Dated at 67 and 67 m.y.

Kq Quartz monzonite (Upper Cretaceous)-Stocks of pinkish-gray medium-grained rock. Dated at 68, 69 and 70 m.y.

Kg Granodiorite (Upper Cretaceous)-Stocks of gray, medium-grained, locally porphyritic rock. Dated at 68 m.y.

Ksv SEDIMENTARY AND VOLCANIC ROCKS, UNDIVIDED (UPPER CRETACEOUS)-Volcaniclastic conglomerate, sandstone, lacustrine shale and some andesitic and rhyolitic tuff

Kus LOWER CORDILLERAN (LARAMIDE) IGNEOUS AND SEDIMENTARY ROCKS (UPPER CRETACEOUS)-Upper sedimentary rocks-Mainly conglomerate and sandstone; includes some tuffaceous rocks. Thickness as much as several hundreds of meters

Kr RHYOLITE (UPPER CRETACEOUS)-Lava flows, tuffs and interbedded conglomerate and sandstone

Krt RHYOLITE TUFF (UPPER CRETACEOUS)-Includes airfall and ashflow tuffs, tuff breccia, welded tuff and sedimentary rocks

Ka ANDESITE (UPPER CRETACEOUS)-Lava flows, breccia sheets and interbedded conglomerate and sandstone

Klq Lower quartz monzonite and granodiorite-Includes some quartz diorite; appears in small stocks. Locally associated with mineralization. Dated at 70, 71, 72, 73, 74, 74, 74 and 76 m.y.

Ks LOWEST CORDILLERAN (LARAMIDE)SEDIMENTARY ROCKS-Sedimentary rocks (Upper Cretaceous)-Includes Fort Crittenden Formation and formation near Javelina Canyon of Epis (1956). Mainly conglomerate, sandstone and siltstone; includes some redbeds, fossiliferous black shale and tuffaceous rocks. Thickness several tens to several hundreds of meters

Ki Rhyodacite porphyry (Upper and Lower Cretaceous)-Mainly stocks, sills and some dikes but possibly includes some tuffs. Some of the rocks may be as young as rhyodacite tuff and welded tuff

Kb BISBEE GROUP (LOWER CRETACEOUS)-Mainly gray shale and siltstone and some sandstone, conglomerate and limestone

Kbu BISBEE FORMATION OR GROUP, UNDIFFERENTIATED (LOWER CRETACEOUS)-Upper part of Bisbee Formation or Group, undifferentiated and related rocks-Includes ipper part of Bisbee Formation, Mural Limestone, Morita, Cintura, Willow Canyon, Apache Canyon, Shellenberger Canyon and Turney Ranch Formations (not listed in stratigraphic sequence) of the Bisbee Group, Armole Arkose of Bryant and Kinnison (1954) and Angelic Arkose. Consists of brownish- to reddish-gray arkose, siltstone, sandstone, conglomerate and some fossiliferous gray limestone. Commonly several hundred meters thick.

Kba BASALTIC ANDESITE AND ANDESITE (LOWER CRETACEOUS)-Lava flows, cinder deposits and some dikes, sills and plugs

Kbg Glance Conglomerate of Bisbee Group, or Glance Conglomerate Member of Bisbee Formation-Typically limestone-pebble-and cobble conglomerate; locally granite or schist conglomerate. Mostly less than 10 meters thick; locally several hundreds of meters thick

Kbt BATHTUB AND TEMPORAL FORMATIONS, UNDIVIDED (LOWER CRETACEOUS)-Andesitic to rhyolitic rocks, conglomerate and sandstone

Klvs LOWER VOLCANIC AND SEDIMENTARY ROCKS (LOWER CRETACEOUS)-Andesitic to rhyolitic volcanic rocks, conglomerate and sandstone. As much as several hundreds of meters thick

?INTRUSIVE ROCKS (JURASSIC)

Jg GRANITE STOCKS

Jr RHYOLITE PLUGS

JTri INTRUSIVE ROCKS (JURASSIC AND TRIASSIC)-Rhyolitic porphyry plutons, dikes and sills

JTrvs VOLCANIC AND SEDIMENTARY ROCKS (JURASSIC TO UPPER TRIASSIC)-Rhyolitic welded tuff and lava flows, andesitic lava flows, eolian sandstone and redbeds. Includes Walnut Gap Formation, Canelo Hills Volcanics and Gardner Canyon and Mount Wrightson Formations

Trm MONZONITE ROCKS (TRIASSIC)-Stocks of dark-gray very coarse-grained monzonite and quartz monzonite. Dated at 184, 190 and 210 m.y.

Trs SEDIMENTARY ROCKS (TRIASSIC)-Red mudstone, sandstone and conglomerate and intercalated rhyodacite volcanic rocks. As much as several hundreds of meters thick. Dated at 192 m.y.

Trvs VOLCANIC AND SEDIMENTARY ROCKS (TRIASSIC)-Rhyolite to andesitic lava and pyroclastic rocks and intercalated sandstone, quartzite and some conglomerate. As much as 3000 meters thick. Dated at 220 m.y.

PzYm METAMORPHIC ROCKS (PALEOZOIC OR MIDDLE PROTEROZOIC)- Meta-quartzite, hornfels and calc-silicate carbonate rocks

Pzs SEDIMENTARY ROCKS (PALEOZOIC)-Rainvalley Formation (Lower Permian) to Bolsa Quartzite (Middle Cambrian), undifferentiated

PPn NACO GROUP (LOWER PERMIAN AND PENNSYLVANIAN)-Mainly limestone and dolomite; some siltstone, sandstone and marlstone

Ps Sedimentary rocks (Lower Permian)-Consists of Rainvalley Formation, Concha Limestone and Scherrer Formation, undifferentiated. Rainvalley Formation is a sparsely fossiliferous limestone, dolomite and some sandstone, 90-120 meters thick. Concha Limestone is dark-gray, cherty, fossiliferous limestone, 120-180 meters thick. Scherrer Formation is a light-pinkish-gray fine-grained quartzite with some basal reddish-gray siltstone and a medial gray dolomite unit, 240-310 meters thick

PPs Sedimentary rocks (Lower Permian and Upper Pennsylvanian)-Consists of Epitaph Dolomite (Lower Permian), Colina Limestone (Lower Permian) and Earp Formation (Lower Permian and Upper Pennsylvanian), undifferentiated. Epitaph Dolomite is a dark- to light-gray slightly cherty dolomite, limestone, marl, siltstone and gypsum, 120-280 meters thick. Colina Limestone is a medium-gray, thick-bedded, sparsely cherty and sparsely fossiliferous limestone, 120-280 meters thick. Earp Formation is a pale-red siltstone, mudstone, shale and limestone, 120-240 meters thick

Ph Horquilla Limestone (Upper and Middle Pennsylvanian)-Light-pinkish-grey, thick- to thin-bedded, cherty, fossiliferous limestone and intercalated pale-brown to pale reddish-gray siltstone that increases in abundance upward. Typically 300-490 meters thick

Ms SEDIMENTARY ROCKS (MISSISSIPPIAN)-Generally only Escabrosa Limestone; to the east unit also includes Paradise Formation, mostly shale

MDs SEDIMENTARY ROCKS (MISSISSIPPIAN AND DEVONIAN)-Consists mainly of Escabrosa Limestone (Mississippian)-locally (Armstrong and Silberman, 1974) called Escabrosa Group-and Martin Fromation (Upper Devonian), undifferentiated. In part of Chiricahua Mountains also includes Paradise Formation (Upper Mississippian) and Portal Formation of Sabins, 1957a (Upper Devonian). In the Little Dragoon Mountains and some adjacent hills also includes Black Prince Limestone, whose fauna and correlation show strongest affinities with Mississippian rocks but which may include some Pennsylvanian rocks. Escabrosa Limestone is a medium-gray, massive to thick-bedded, commonly crinoidal, cherty, fossiliferous limestone 90-130 meters thick. Martin Formation is thick- to thin-bedded, gray to brown dolomite, gray sparsely fossiliferous limestone and some siltstone and sandstone, 90-120 meters thick. Paradise Formation is a brown, fossiliferous, shaly limestone. Portal Formation is a black shale and limestone, 60-105 meters thick. Balck Prince Limestone is a pinkish-gray limestone with a basal shale and chert conglomerate, as much as 52 meters thick

Pzl LOWER PALEOZOIC FORMATIONS, UNDIVIDED (UPPER DEVONIAN TO MIDDLE CAMBRIAN)-Mainly limestone and dolomite; some sandstone, shale and conglomerate. Includes Percha Shale, Portal, Swisshelm, Martin, El Paso and Abrigo Formations, Coronado Sandstone and Bolsa Quartzite

OCs SEDIMENTARY ROCKS (LOWER ORDOVICIAN TO MIDDLE CAMBRIAN)-El Paso Limestone (Lower Ordovician and Upper Cambrian), Abrigo Formation (Upper and Middle Cambrian) and Bolsa Quartz (Middle Cambrian), undifferentiated. -El Paso Limestone is a gray, thin-bedded cherty limestone and dolomite 90 meters to about 220 meters thick. Abrigo Formation is a brown to white or purple-gray, thick-bedded, coarse-grained quartzite and sandstone with a basal conglomerate, 90-180 meters thick. To the east, equivalents of part of the Abrigo Formation and Bolsa Quartzite are known as the Coronado Sandstone

Cs Sedimentary rocks (Upper and Middle Cambrian)-Abrigo formation (Upper and Middle Cambrian) and Bolsa Quartzite (Middle Cambrian), undifferentiated

Yd DIABASE (MIDDLE PROTEROZOIC)-Includes some metadiorite; in sills, dikes and plugs; line shows more acidic rock

Ya APACHE GROUP (MIDDLE PROTEROZOIC)-Sandstone, shale, argillite, some conglomerate and possibly some limestone

Yg INTRUSIVE ROCKS (MIDDLE PROTEROZOIC)-Granite, granodiorite and some alaskite, aplite and lamprophyre

Yw Wrong Mountain Quartz Monzonite-A 2-mica gneissic rock thermally metamorphosed during the Oligocene and possibly related to a Paleocene magmatic event, but with relicts of Precambrian(?) age recorded locally

Yr Rincon Vally Granodiorite-Typically unfoliated biotite granodiorite and locally hornblende-biotite granodiorite. Dated at 1450, 1540 and 1560 m.y.

Yc Continental Granodiorite-Very coarsely porphyritic granodiorite, meta-granodiorite and gneissic franodiorite, possibly of batholithic-sized bodies. Dated as 1360 and 1450 m.y., and possibly slightly older

Yt Tungsten King Granite-Coarse-grained porphyritic biotite granite

YXm GNEISSIC ROCKS (MIDDLE AND EARLY PROTEROZOIC)-Metamorphosed granite and older schist or gneiss

Xj Johnny Lyon Granodiorite-Commonly an alltered, massive, hornblende-biotite granodiorite; locally a biotite grano-diorite and locally metamorphose Dated at 1630 m.y.

Xp PINAL SCHIST (EARLY PROTEROZOIC)-Schist, phyllite, metaquartzite, metagraywacke and meta-igneous rocks

Xl RHYOLITE PORPHYRY (PRECAMBRIAN X)-Stocks and intrusive sheets; mainly older than regional metamorphism but some sheets younger than metamorphism

x 3 Magnetic properties measurement site and number

CONTACT-Dotted where concealed, queried where uncertain

FAULT-Showing dip; dotted where concealed or intruded, queried where uncertain. Where solid line becomes dotted line within a mpa unit, that unit is a composite of several formation, of which a younger one conceals faulting in an older one

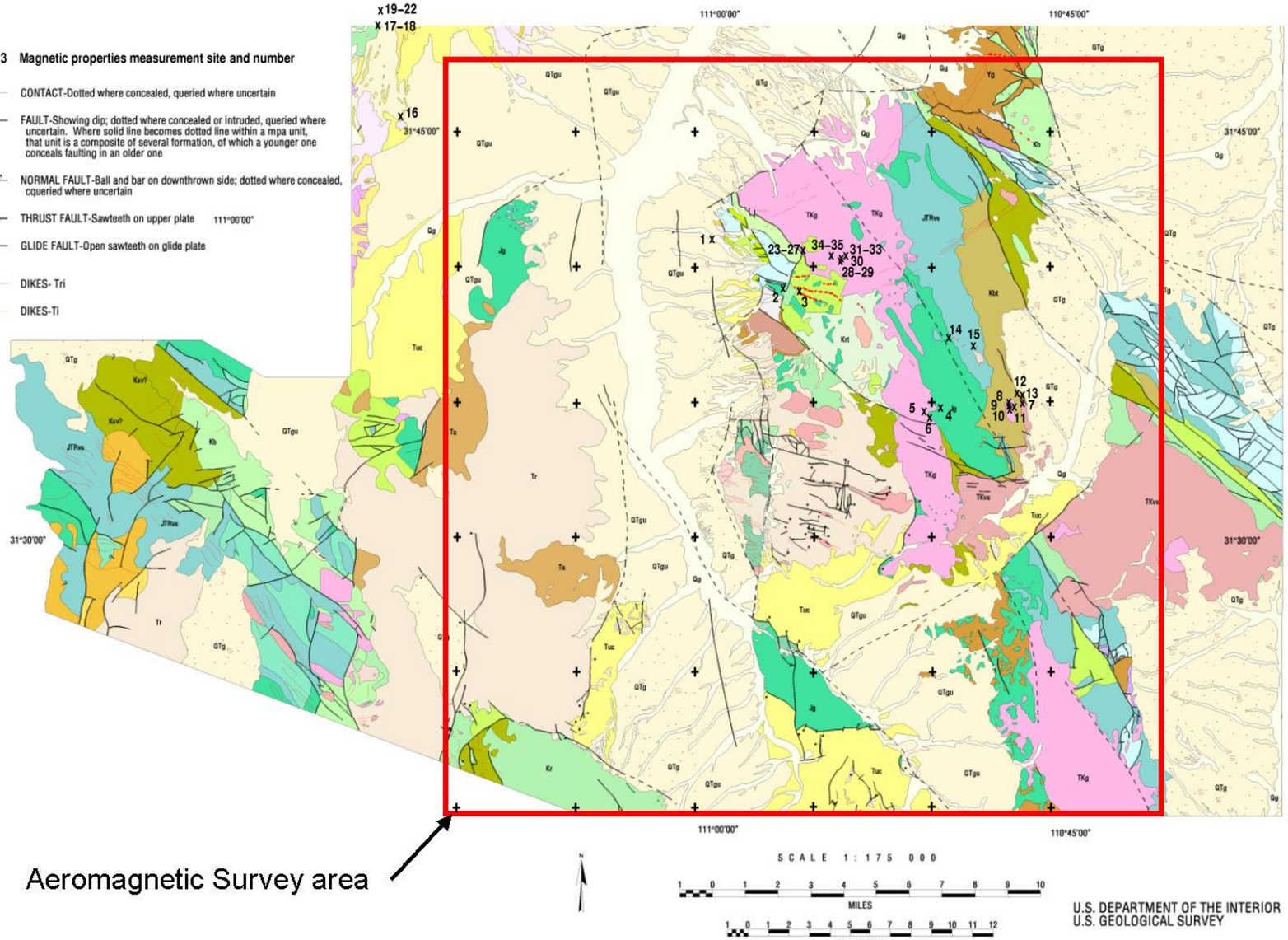
NORMAL FAULT-Ball and bar on downthrown side; dotted where concealed, cqueried where uncertain

THRUST FAULT-Sawteeth on upper plate

GLIDE FAULT-Open sawteeth on glide plate

DIKES- Tri

DIKES-Ti



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