GEOLOGIC MAP OF THE FAIRBANK 7½' QUADRANGLE, COCHISE COUNTY, ARIZONA

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Arizona Geological Survey Digital Geologic Map 50 (DGM-50), version 2.0

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1:24,000 scale

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Map Unit Descriptions

Other Units

d — **Disturbed ground** - disturbed due to agriculture, extensive excavation, and blockage of drainages for cattle tanks.

Qtc — **Quaternary hillslope talus and colluvium** - unconsolidated to moderately-consolidated talus and colluvium deposits mantling the lower slopes of bedrock outcrops.

San Pedro and Babocomari River Alluvium

Qyr — **Active river channel deposits** - Deposits are dominantly unconsolidated, very poorly sorted sandy to cobbly beds exhibiting bar and swale microtopography but can range from fine silty beds to coarse gravelly bars in meandering reaches based on position within the channel. Clasts are typically well-rounded but may be angular to subangular. Qycr deposits are typically unvegetated to lightly vegetated and exhibit no soil development. Qycr deposits are entrenched from 30 cm to 5 meters or more below adjacent early historical floodplain deposits depending on location, geomorphic relationship, and local channel conditions. Although much of the San Pedro and Babocomari Rivers were perennial streams historically, some sections are dry or nearly dry at the surface during much of the year. These deposits are the first to become submerged during flow events and can be subject to deep, high velocity flow and lateral bank erosion. In some areas of the Babocomari River channel deposits are very thin to discontinuous exposing underlying bedrock. Extent of channel deposit and exposed bedrock varies and shifts with significant flooding.

Qyf — **Flood channel and low terrace deposits** - Deposits are found adjacent to active channels in the form of lightly vegetated in-channel bars, small planar fluvial terraces within 30 cm of river elevation, and recent erosional meanders outside the presently active channel. Terrace deposits are inset into older river alluvium and are generally narrow, rarely more than 100 meters across. Qy4r deposits are composed of poorly sorted unconsolidated sediments ranging from fine silts to gravel bars depending on location in the channel at the time of deposition. Pebbles and cobbles are well-rounded to sub-rounded. These surfaces are commonly inundated under moderate to extreme flow events and can be subject to deep, high velocity flow and lateral bank erosion. These deposits do not exhibit soil development but may exhibit a light vegetation cover of small trees, bushes, and grasses.

Qyr — **Historical river terrace deposits** - Terrace deposits that occupy elevations from 1 to 2 meters above Qycr or Qy4r deposits and are inset below the pre-incision historical floodplain. These surfaces are generally planar but exhibit bar and swale microtopography. Although no soil development is present, dense grasses and small mesquite trees abound. Sediments composing these deposits are poorly sorted silt, sand, pebbles and cobbles. Pebbles and cobbles are well-rounded to subangular. Trough crossbedding, ripple marks, and stacked channel deposits viewable in cross-section indicate deposition in a low to moderate energy braided stream environment. These deposits are prone to flooding during extreme flow events, and undercutting and rapid erosion of Qy3r surfaces is possible during lower flow events.

Qyr — **Latest Holocene to historical river terrace deposits** - Deposits associated with the floodplain that existed prior to the early historical entrenchment of the San Pedro and Babocomari Rivers (Hereford, 1993; Huckleberry, 1996; Wood, 1997). Qy2r deposits are associated with broadly planar surfaces that locally retain the shape of historical river meanders. Qy2r surfaces are up to 7 meters above modern Qycr deposits and are the most extensive river terraces in the valley. Qy2r sediments were deposited when the San Pedro and Babocomari Rivers were widespread, shallowly-flowing river systems and are dominated by fine grained floodplain deposits. Dense mesquite bosque and tall grass is typically present on these surfaces except where historic plowing or grazing has taken place. These surfaces appear predominantly fine grained at the surface due in part to the input of organic matter and windblown dust deposition but are composed of interfingering coarse sandy to pebbly braided channel and fine sand to silty river floodplain deposits. Where Qy2r deposits are moderately to deeply incised they not subject to inundation by river floods, but they may be flood-prone in areas with less channel incision. Qy2r deposits are subject to catastrophic bank failure due to undercutting and lateral erosion during flow events. Distal piedmont fan deposits (Qy2 ,Qyaf, and Qys) onlap onto Qy2r deposits although an interfingering relationship likely exits in the subsurface.

Qyr — **Late to early Holocene river terrace deposits** - Deposits associated with slightly higher terraces that represent either higher elements of the early historical floodplain or remnants of older Holocene aggradation periods. These fine-grained terrace deposits commonly have been disturbed by plowing or cattle grazing. When undisturbed, Qy1r deposits are densely vegetated by mature mesquite trees (mesquite bosque) and tall grasses. Soil development is moderate and surface color ranges from 10 to 7.5 YR 4/4. Due to the dense vegetation input of organic matter at the surface is high and often results in a thin (< 10 cm) organic soil horizon. A light dusting (incipient stage I) calcium carbonate accumulation is evident on the undersides of some buried clasts. Qy1r surfaces are up to 7 meters above the active channel in highly incised locales and typically are less than 1.5 m higher than adjacent Qy2r surfaces. Along the Babocomari River Qy1r terraces are found along the valley margins. These terraces typically are covered with fine-grained floodplain deposits, but relict gravel bars and erosional contacts are common.

Qlr — **Late Pleistocene river terrace deposits** - Unit Qi3r consists of remnant river terrace deposits. These terraces are typically 5 to 10 m above the active channel, and in a few areas it is clear that this unit encompasses two terraces separated by a few meters of elevation. Qi3r deposits consist of cobbles, gravels and finer-grained sediment. Qi3r surfaces commonly have loose, open lags of cobbles and gravels; surface clasts exhibit weak rock varnish. Qi3r surfaces appear light orange color aerial photos, reflecting slight reddening of surface clasts and the surface soil horizon. Qi3r soils are moderately developed, with orange to reddish brown sandy loam to clay loam argillic horizons and stage II calcium carbonate accumulation.

Qlr — **Middle to late Pleistocene river terrace deposits** - Unit Qi2r consist of isolated paleoterraces found outside of the incised river. Qi2r is composed of cobble to pebble clast-supported conglomerate, with subrounded to round clasts, composed of granite, limestone, marl, and quartzite. This surface is approximately 2 m thick and is degraded with beveled edges. Due to the degradation and parent material, soil is not preserved on some of these surfaces.

Qlr — **Early to middle Pleistocene river terrace deposits** - Unit Qi1r consists of the highest paleoterrace deposits. Qi1r is composed of cobble to pebble clast supported conglomerate, with subrounded to round clasts, composed of granite, limestone, marl, and quartzite. Clasts exhibit moderate rockvarnish and soils are typically reddened, clay argillic horizon, stage III secondary carbonate, and blocky peds. Qi1r surfaces are flat lying and beveled to rounded near their edges. Qi1r surface appear orangish brown in air photos.

Qor — **Early Pleistocene river terrace deposits** - Unit Qor consists of very high remnant river terrace deposits emanating from Babocomari Wash. The tops of these terraces are 30 to 40 m above the active channel of Babocomari Wash and San Pedro River. Qor deposits consist of cobbles, pebbles, and a few small boulders with sand and finer-grained sediment. Qor surfaces commonly have a loose cobble and pebble lag; surface clasts exhibit moderate to strong rock varnish. Qor surfaces appear dark reddish brown in color aerial photos, reflecting reddening of surface clasts and relatively clay-rich surface soil horizon with some dark organic material. Soils typically have brown to reddish brown clay argillic horizons over indurated stage IV carbonate horizons where surfaces are well preserved.

Piedmont alluvium and surficial deposits

Qyc — **Modern stream channel deposits** - Unit Qyc includes only active, open channels of tributary washes on the piedmonts that could be delineated at a scale of 1:24,000. This unit is composed of moderately-sorted sand, gravel, and pebbles with some cobbles in the lower piedmont areas to poorly-sorted sand, gravel, pebbles, and cobbles in the upper piedmont areas. Channels are generally incised less than 0.5 to 1 meter below adjacent Holocene terraces. Channel morphologies generally consist of a single thread deep high flow channel or multi-threaded shallow low flow channels with adjacent gravel bars. The channels are flood prone and are subject to deep, high velocity flow during moderate to large flood events. Channels are subject to scouring and bar deposition. Banks are subject to lateral erosion. There is no soil development in this active fluvial unit, and little or no vegetation within the channels.

Qy3 — **Latest Holocene alluvium** - Recently active piedmont alluvium located primarily along active drainages including floodplain, low-lying terrace, and overflow channels. Qy3 deposits are composed of unconsolidated to very weakly consolidated silty to cobbly deposits and exhibit greater vegetation than Qyc deposits. These deposits generally exhibit bar and swale microtopography and are susceptible to inundation during moderate to extreme flow conditions when channel flow exceeds capacity. Soil development is generally absent or incipient on Qy3 deposits which exhibit pale buff to light brown (10 YR) surface coloration.

Qyaf — **Late Holocene alluvium, active fan deposits** - Qyaf deposits consist of active alluvial fan deposits in the San Pedro valley. These deposits have distributary drainage patterns and are extremely prone to flooding and channel migration. Sediments are unconsolidated and consist of very poorly sorted sand to cobbles. Vegetation includes small mesquite trees, shrubby acacia, prickly pear, and medium creosote.

Qy2 — **Late Holocene alluvium** - Unit Qy2 consists of recent alluvium on floodplain and low terraces that shows evidence of intermittent inundation during large flood events. Qy2 deposits are composed of siltstone with pockets of conglomerate lag. Qy2 deposits are located along active channels less than 2 m above the active channels. Surfaces are commonly planar. Qy2 soils are weakly developed, 10 YR 5/3 brown to light brown, with no ped development, no secondary carbonate. Qy2 is primarily vegetated by opportunistic grasses.

Qy1 — **Older Holocene alluvium** - Qy1 deposits consist of terraces along tributary drainages and broad, low-relief, undulating fan deposits, that exhibit shallow widespread braided drainage patterns, and sit higher in the landscape than younger Holocene alluvium. Portions of these deposits are mantled by coarse to very coarse angular quartz sand and exhibit diverse vegetation patterns dominated by cholla, prickly pear, small (1-1.5 m tall) mesquite, and numerous small shrubs and grasses. Overall relief between broad fan crests and incised drainages on gently rolling Qy1 deposits typically does not exceed 1.5 meters. Numerous shallow braided channels drain widespread portions of Qy1 surfaces. Qy1 deposits exhibit incipient calcium carbonate accumulation (stage I) and soil development characterized by medium brown (10-7.5 YR) coloration where unincised. Deposition of Qy1 sediments in a braided channel aggrading alluvial fan environment has, in places, resulted in shallow burial of adjacent piedmont deposits. This relationship is visible along incised channels where thin Qy1 deposits overly redder, grusy, clay-rich Qi2 or Qi3 deposits.

Qys — **Fine-grained Holocene alluvium derived from the Saint David Formation** - Thin, fine-grain Holocene alluvial deposits mantling valley bottoms. Sediment is mainly clay, silt and sand, with occasional deposits of open, unvarnished, fine gravel. Soil development is minimal. Where it has developed soil is typically a brown (7.5YR) sandy loam with substantial disseminated carbonate but no visible carbonate accumulation.

Qy — **Holocene alluvium, undifferentiated** - Unit Qy consists of young deposits in small channels, low terraces, and alluvial fans. It also includes thin fan aprons shed from eroded slopes formed in basin fill. Deposits vary widely in particle size. Qy deposits on the upper piedmont and along major tributaries are typically quite coarse, including boulders, cobbles, pebbles, sand, and minor silt and clay. Farther downslope, Qy deposits are quite fine, consisting mainly of sand and silt, with minor fine gravel and clay. Small channels generally are incised less than 1 m below adjacent Qy terraces and fans. Channel morphologies generally consist of a single-thread channel or multi-threaded channels, with local distributary channel systems. Local relief on Qy deposits varies from fairly smooth channel bottoms to the undulating bar-and-swale topography that is characteristic of coarser deposits. Terrace surfaces typically are planar, but small channels are also common on terraces. Soil development associated with Qy deposits is weak to moderate. Soil clay accumulation is minimal, and calcic horizon development is typically stage I. Terrace and fan surfaces are brown, and on aerial photos they generally appear darker than surrounding areas, whereas sandy to gravelly channels appear light-colored on aerial photos.

Qls — **Late Pleistocene alluvial fan and terrace deposits** - Unit Qi3 consists of deposits that fill the valleys incised into the Saint David Formation, Qo, and Qi2 alluvial fan complexes. Qi3 deposits are composed of mudstone with some floating cobbles within the mud matrix. These surfaces are flat with punctuated slot incised channels. Qi3 has portion of the surface that are relatively unincised with to up to 3m of incision down tributary toward the San Pedro River. Closer to the river isolate remnants of Qi3 outcrop along the tributary valleys. Soils are weak to moderately developed with of clay loam, small blocky peds, 7.5 YR 5/4, and filament carbonate. Qi3 surface appear as buff in air photos. Qi3 is dominated by sacaton grasses and medium size mesquite trees. Qi3 represents the valley fill that is subsequently incised due to down cutting in the San Pedro River.

Qls — **Middle to late Pleistocene alluvial fan and terrace deposits** - Qi2 unit consists of planar fan surfaces perched higher than the surrounding canyons and composed of cobble conglomerate with granite and Paleozoic limestone clasts. Qi2 surfaces are relatively flat with some beveling near the edge of major drainages and punctuated incision near smaller drainages. This surface could experience some sheet flooding during moderate storm events. Qi2 have moderately developed soils with small to medium prismatic peds, sandy clay loam, immature elluvial clay horizon, 7.5 YR 4/4, and stage II to III secondary carbonate. Qi2 surfaces are vegetated by small to medium mesquite and acacia trees with interspersed grasses and shrubs. These surfaces appear light orange in the air photos. Qi2 represent the last phase of fan development before the first stage of entrenchment of the San Pedro River.

Qi1 — **Early to middle Pleistocene alluvial fan and terrace deposits** - Unit Qi1 consists of deeply incised alluvial fan deposits. Qi1 deposits are composed of carbonate cemented conglomerate with metasediment, limestone, and sandstone cobbles that have a .5 m thick clay horizon mantling top of the surface. Qi1 is beveled and dissected by deeply incised slot channels. Qi1 soils are well developed, 10 R 4/8 reddish brown, stage IV secondary carbonate development, large prismatic peds with well develop clay coats. Qi1 represents a major fan complex that developed along the mountain front. Qi1 is primarily vegetated by junipers, ocotillo, green torn bush, and prickly pear.

Qo — **Early Pleistocene alluvial fan deposits** - Qo unit consists of high ridges and fan surfaces along the eastern portion of the mapped area that are deeply incised alluvial fans shed off the western piedmont of the Dragoon Mountains. Qo is composed of cobble to pebble conglomerates that vary from to matrix- to clast-supported, with a calcium carbonate matrix. Clasts are subrounded to rounded, 15-30 cm diameter, and consist of limestone, metasedimentary, and quartzite. The surface is covered with carbonate chips and capped in places with a stage IV to V petrocalcic horizon. Qo surfaces are exposed as isolated outcrops in some places, surrounded by younger alluvial deposits. No soils are preserved on these surfaces which appear as light bands axial to the mountain front on air photos. Qo surfaces are usually absent of trees and dominated by creosote and whitethorn acaria shrubs, with occasional ocotillo. Qo deposits represent the oldest exposed alluvial fans in the mapped area and commonly rest on top of the Saint David Formation with an erosional contact.

Qof — **Early Pleistocene fine-grained basin-fill alluvium** - Unit Qof consists of very old relict basin floor deposits forming a minimally dissected surface that dips gently to the northeast in the northeastern part of the map area. The Qof surface is brown in color, with abundant carbonate litter derived from the underlying petrocalcic horizon. Surface deposits are primarily sand and silt, with little or no gravel. Exposures around the margins of the plateau reveal the existence of a ~1 to 2 m thick carbonate cemented layer that is probably a petrocalcic horizon. Small, uncised swales evidently convey surface runoff across this surface, and deposits ranging in age from Holocene to middle Pleistocene appear to lap onto the Qof surface from the Whetstone-Mustang piedmont. Qof deposits in this area sit immediately above basin-fill deposits, probably the middle Saint David Formation (Shipman and Ferguson, 2003).

Quaternary to Tertiary Basin Fill alluvium - Piedmont alluvial fan deposits on the middle piedmont consisting of coarse, poorly sorted, sands and gravels, sandstone, conglomeratic sandstone, and conglomerate. Colors range from tan to pinkish tan to reddish tan to reddish medium brown. In some cases, paleosols developed on top of one bed before the next was deposited. On the lower piedmont this unit is composed of thinly bedded distal fan sands and gravels. This unit roughly correlates to upper Saint David Formation.

QTsd — **Pliocene to early Pleistocene St. David Formation** - Unit QTsd consists primarily of hillslope deposits formed on fine, highly eroded basin-fill deposits. QTsd surfaces typically are alternating eroded ridges and valleys, with ridgecrests typically 10 to 30 meters above adjacent active channels. Surfaces are drained by deeply incised tributary channel networks and even the highest surfaces atop ridges are rounded. QTsd deposits typically are covered by hillslope colluvium and are poorly exposed, but where exposed they consist of tan to reddish sand and gravel in parts of the Huachuca piedmont and red and green mudstones, siltstones and marl, with some gypsiferous beds in the Babocomari Valley. Some beds are moderately indurated, but generally QTsd deposits are weakly indurated. On aerial photos, QTsd surfaces are generally gray to white, but include some dark reddish brown areas where clay is more abundant. QTsd surfaces support creosote, mesquite, ocotillo, and cholla.

QTsf — **Early Pleistocene basin fill alluvial fan deposits** - Piedmont alluvial fan deposits on the middle piedmont consisting of coarse, poorly sorted, sands and gravels, sandstone, conglomeratic sandstone, and conglomerate. Colors range from tan to pinkish tan to reddish tan to reddish medium brown. In some cases, paleosols developed on top of one bed before the next was deposited. On the lower piedmont this unit is composed of thinly bedded distal fan sands and gravels. This unit roughly correlates to upper Saint David Formation.

Bedrock units

Tg — **Conglomerate (Cenozoic)** - Tan, thin- to medium-bedded, pebble-cobble, sandy matrix conglomerate and pebbly sandstone dominated by angular to sub-rounded clasts of Uncle Sam Tuff, and porphyry of Fairbank. The sandy matrix consists of quartz, feldspar, lithic grains, and 5-10% heavy and opaque minerals.

TKm — **Mafic dikes (Cenozoic-Cretaceous)** - Fine-grained, crystalline matrix porphyry dikes, containing 1-5%, 1-2.5mm melt inclusion-rich plagioclase, 1-3% 1mm clinopyroxene, and 5% 1-3mm strongly altered grains.

Kbi — **Basaltic dikes (Cenozoic-Cretaceous)** - Fine-grained basaltic dikes containing 1-2% >1.5mm plagioclase phenocrysts in a fine-grained crystalline matrix with aligned plagioclase microlites.

Kad — **Coarse-grained andesite porphyry dikes (Upper Cretaceous)** - Dark gray, crystalline matrix, northeast-striking, steeply southeast-dipping, 0.2 to 8m thick, andesite porphyry dikes containing 12-30% 2-5mm euhedral plagioclase phenocrysts, and a few % altered mafic phenocrysts. The porphyry also contains sparse quartz phenocrysts (1-4mm), and locally up to 15% 1-10cm, fine-grained dioritic inclusions. Two dikes (field stations CAF-2-10036, CAF-2-11925), and one stock-like intrusive mass of this unit along the eastern edge of the map area are composite with cores of medium-grained, slightly plagioclase-porphyritic, 10% biotite-hornblende, quartz monzonite. Dikes of this unit intrude the quartz monzonite of Brunckow Hill and the Schefflien Granodiorite near Tombstone.

Kg — **Quartz monzonite of Brunckow Hill (Upper Cretaceous)** - Medium-grained, slightly plagioclase-porphyritic, 10% biotite-hornblende, quartz monzonite to quartz monzodiorite. The quartz monzonite contains 1-10%, 1-10cm, rounded irregular fine-grained dioritic inclusions. Marvin and Cole (1978) report a K/Ar biotite age of 76.30 + 1.80 Ma for this unit.

Krd — **Porphyry of Fairbank (Upper Cretaceous)** - Phenocryst-rich porphyry containing 25-40% phenocrysts of plagioclase (0.5-5.0mm), potassium feldspar (0.5-3.0mm), quartz (0.5-5mm), biotite (0.5-2.5mm), and 1-10%, 1-10cm, rounded irregular, fine-grained dioritic inclusions. The porphyry, although containing a phenocryst assemblage essentially identical to the Uncle Sam Tuff, can be distinguished from the tuff by a slightly coarser grained, more evenly distributed porphyritic texture, and the lack of pumice and lithic lapilli. The porphyry of Fairbank displays flow-foliation along its intrusive contacts in some areas, and north of the town of Fairbank, locally has a dark vitric matrix along intrusive contact zones. Usually, however, the matrix is crystalline, and crumbly. To the south an extensive network of laccolith shaped sills and dikes intrude the Uncle Sam Tuff northeast of the Charleston Lead Mine. The porphyry in this area is also characteristically hematite stained, and argillic altered along contacts, and forms recessive slopes and valleys between the more resistant, dark-colored steep hills and knobs of the Uncle Sam Tuff.

Ku — **Uncle Sam Tuff (Upper Cretaceous)** - Phenocryst-rich ash-flow tuff containing 25-40% phenocrysts of plagioclase (0.5-3.0mm), sanidine (0.5-2.0mm), quartz (0.5-5mm), and biotite (0.5-2.5mm). Lithic lapilli (1-25%) consist chiefly of andesite and rhyolitic volcanics, sandstone, and argillite. Pumice lapilli, rarely significantly compacted, make up between 1 and 20% of the tuff. The pumice lapilli contain similar phenocrysts as in the tuff matrix, but the phenocrysts are slightly larger, more euhedral, and display a more evenly distributed texture. The tuff also contains 1-10%, 1-10cm, rounded, irregular, fine-grained dioritic inclusions. Most of the dioritic inclusions are not believed to be exotic lithic fragments because the same inclusions (in roughly the same abundance, and size range) are found in the porphyry of Fairbank (Krd), the quartz monzonite of Brunckow Hill, and a distinctive swarm of coarse-grained, andesite porphyry dikes (Kad). The tuff is typically dark gray with a very fine-grained crystalline to vitric matrix and is usually resistant, forming steep rounded hills and knobs. To the north, the tuff includes extensive zones of megabreccia which are typically less resistant, forming slopes and low areas. Clasts in the megabreccia are similar to those seen elsewhere in the tuff, but also include zones of carbonate clasts in the northeast. Marvin et al. (1973) report a K/Ar biotite age of 73.5 + 2.80 Ma for this unit from a sample along the western edge of the map area.

Kux — **Uncle Sam Tuff megabreccia (Upper Cretaceous)** - Zones of megabreccia within the Uncle Sam Tuff. Clasts of andesite and rhyolitic volcanics, sandstone, argillite, and carbonate range in size from 1cm to several meters.

Kuxa — **Uncle Sam Tuff andesite megabreccia (Upper Cretaceous)** - Zones of monolithic, andesite lava megabreccia within the Uncle Sam Tuff. Clasts range in size from 1cm to several meters.

Kdx — **Coarse-grained andesite (Cretaceous)** - A volcanic complex dominated by coarse-grained, phenocryst-rich andesitic lava and probable hypabyssal bodies containing 15-30% 1-4 mm plagioclase phenocrysts, 1-5% 1-3 mm pyroxene phyrocysts, and sparse opaques and altered mafics. The unit consists of amalgamated lava flows and welded ash-flow tuff units of similar composition. To the north a series of gently northwest-dipping basaltic and basaltic andesite lava flows are interbedded with bedded pyroclastic and volcaniclastic sedimentary units.

Kr — **Rhyolite (Cretaceous)** - Rhyolite, probably chiefly a hypabyssal body, containing 5-10% 1-2.5mm quartz and feldspar phenocrysts. This unit is dominated by two large, massive, flow-foliated bodies to the south of the Charleston Lead Mine. This rhyolite is distinguished from the aphyric rhyolite (Kra) because it contains at least 5% quartz and feldspar phenocrysts.

Krt — **Nonwelded ash-flow tuff (Cretaceous)** - Felsic, nonwelded, thin- to thick-bedded lithic lapilli-rich ash-flow tuff and ash-fall tuff.

Kam — **Medium-grained andesite dikes (Cretaceous)** - North to northwest-striking, generally steeply dipping andesite dikes containing 10-20% 1-3mm euhedral plagioclase phenocrysts and lesser amounts of altered <2mm mafic phenocrysts.

Kt — **Tuff of Charleston (Cretaceous)** - Rhyolite ash-flow tuff containing 5-10%, 1-2.5mm quartz (2-5%), feldspar (2-5%), and biotite (<1%) phenocrysts, and 1-25% lithic lapilli composed chiefly of andesite lava, sandstone, and argillite. The tuff displays a well-developed eutaxitic foliation throughout its outcrop area. To the east, the tuff includes extensive zones of megabreccia (Ktx) dominated by clasts of andesite lava, pebble conglomerate, sandstone, and argillite.

Ktx — **Tuff of Charleston megabreccia (Cretaceous)** - Zones of the tuff of Charleston containing greater than 25% lithic blocks ranging in size from lapilli to greater than 50m. Lithic blocks are dominated by andesite lava, in particular blocks that consist of mixed zones of fine-grained phenocryst-poor, phenocryst-rich, and medium-grained, moderately phenocryst-rich lava. Blocks of rounded to well-rounded quartzite-clast, sandy matrix conglomerate are also fairly abundant. Much of the megabreccia unit is clast-supported, with very sparse zones of phenocryst-poor, quartz-feldspar-biotite phenocryst rhyolite tuff matrix.

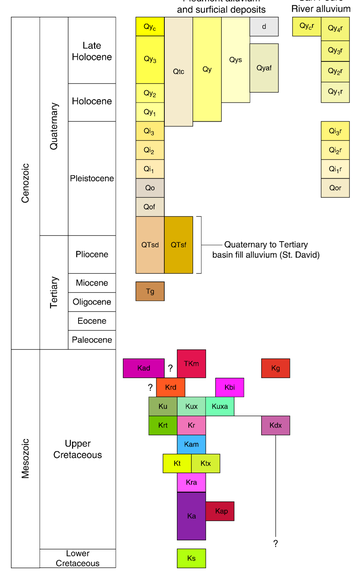
Kra — **Aphyric rhyolite (Cretaceous)** - Aphyric to very phenocryst-poor rhyolite lava with probable zones of hypabyssal rock, and tuff breccia. The unit is typically strongly argillic altered, and is identified as lava in most areas because the unit is dominated by monolithic, angular, clast-supported breccia interpreted as autobrecia. At the western edge of its outcrop area, the aphyric rhyolite is in sharp contact with strongly argillic altered quartz monzonite of Bronco Hill, and the contact appears to be intrusive. Much of the unit in this area consists of heterolithic tuff breccia dominated by clasts of andesite lava, but sparse clasts of medium-grained quartz monzonite similar to the quartz monzonite of Bronco Hill are also present.

Kap — **Andesite porphyry (Cretaceous)** - A distinctive, hypabyssal andesite porphyry containing 10-25%, 1-3mm, euhedral plagioclase phenocrysts in a fine-grained crystalline matrix. Altered biotite phenocrysts (<1.5mm) comprise <5% of the rock. The porphyry also contains 1-10%, 1-10cm, rounded, irregular, fine-grained dioritic inclusions.

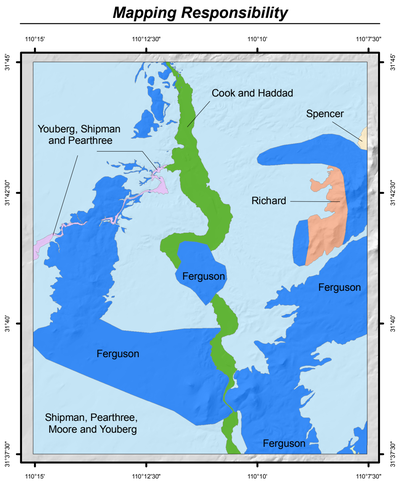
Ka — **Andesite (Cretaceous)** - Amalgamated, andesite lava flows intruded by a myriad of dikes characterized by relatively fine-grained (<3.0mm and usually <2.0mm), euhedral to subhedral plagioclase phenocrysts. The andesite is pervasively propylitically altered with abundant epidote coated fractures and veinlets. Plagioclase phenocrysts ranging in size from <1mm to 3mm are present in abundances ranging from 1% to 30%. In most flows plagioclase phenocrysts are consistent in terms of size and abundance, but heterogenous zones are also present that probably represent andesite flows intruded by complex dike networks. Locally, lava flows are separated by thin sequences of mafic volcaniclastic sandstone, pebble conglomerate and pyroclastic rocks. Measurements of bedding in this map unit are from these thin sequences.

Ks — **Bisbee Group (Lower Cretaceous)** - Complexly intertonguing sequences of thin- to thick-bedded, cross-stratified and plane-bedded, quartz sandstone, feldspathic quartz sandstone, and lithic-feldspathic quartz sandstone, gray-green to red siltstone, mudstone, silty mudstone and shale, locally with abundant calcareous nodules and irregularly thin- to medium-bedded, discontinuous impure limestone, and limestone pebble conglomerate. Sparse, clast-supported and matrix-supported, medium- to thick-bedded sandy matrix, rounded to well-rounded, pebble-cobble conglomerate beds are also present. Clasts in the conglomerate consists of quartzite, argillite, vein quartz, with sparse granitoid, limestone, and felsic volcanics.

Unit Correlation

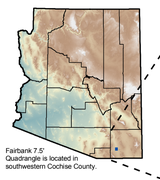


Mapping Responsibility



Location Index Map

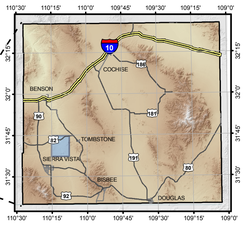
Quadrangle Location Shown in Blue



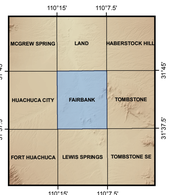
Fairbank 7.5' Quadrangle is located in southwestern Cochise County.

Cochise County

Mapped Area Shown in Blue



Adjoining 7.5' Quadrangles



Map Symbols

Faults
- fault, accurate
- fault, approximate
- fault, concealed

Contacts
- accurate contact
- approximate contact
- queried dashed contact

Structure Symbols
- bedding, inclined 1
- fault attitude
- inclined eutaxitic foliation
- inclined flow foliation
- inclined joint
- vertical joint

Topographic base from USGS 1:24,000 scale quadrangle series. North American Datum of 1983 (NAD83). Projection and 1,000-meter grid: Universal Transverse Mercator, zone 12.

2006 MAGNETIC NORTH DECLINATION

SCALE 1:24,000

1 Miles 0.5 0

1 Kilometers 0.5 0

0 1000 2000 3000 4000 5000 Feet

Contour Interval 25 feet

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