SURFICIAL GEOLOGIC MAP OF THE EMPIRE RANCH 7 ½' QUADRANGLE, PIMA COUNTY, ARIZONA

by
Cook, J.P.

October 2010

Arizona Geological Survey Open-File Report 10-03
(OFR-10-03), version 1.0

Citation for this map:
Cook, J.P., 2010, Surficial geologic map of the Empire Ranch 7 ½' Quadrangle, Pima County, Arizona: Arizona Geological Survey Open-File Report OFR 10-03, scale 1:24,000.

Research supported by the U.S. Geological Survey, National Cooperative Geologic Mapping Program, under assistance award number 08HQAG0093. The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

Map Unit Descriptions

Other units

d — **Disturbed ground** - heavily disturbed ground due to agriculture, extensive excavation, mining, or construction of earth dams

Qtc — **Quaternary hillslope talus and colluvium** - unconsolidated to weakly consolidated, very poorly sorted angular rock debris deposited at the base of bedrock slopes

Piedmont deposits

Qy$_0$ — **Modern stream channel deposits** - Qyc deposits are composed of unconsolidated, very poorly sorted sandy to cobbly intermittent piedmont channel sediments. Channels may exhibit bar and swale microtopography with bars composed of coarser sediments. Qyc deposits are typically unvegetated and exhibit no soil development although small shrubs and grasses can be found on slightly elevated bars. Qyc deposits commonly become submerged during moderate to extreme flow conditions and can be subject to deep, high velocity flow and lateral bank erosion. Channels are generally incised 1 to 2 m below adjacent Holocene alluvium and may be incised into adjacent Pleistocene alluvium by 10 m or more.

Qy$_3$ — **Latest Holocene alluvium** - Recently active piedmont alluvium located primarily along active drainages including floodplain, low-lying terrace, and intermittent tributary channels. Qy3 deposits are composed of unconsolidated to very weakly consolidated sandy to pebbly 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. 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, yucca, and various grasses.

Qy$_2$ — **Late Holocene alluvium** - Qy2 deposits consist of piedmont terrace deposits located primarily along the flanks of incised drainages, broad low-relief distal fan deposits, infrequently active tributary drainage deposits, and broad, low-relief valley sediments inset within eroded Tsy deposits. These deposits consist of predominantly fine grained unconsolidated to weakly consolidated sediments although isolated sub-rounded to sub-angular cobbles and boulders may be present at the surface in small quantities. Where inset into older alluvium, Qy2 deposits are planar with remnant bar and swale microtopography. Distal fan Qy2 deposits are broad and sandy with numerous small braided channel systems. Rarely active Qy2 tributary drainages are generally of limited extent, relatively steep, and more densely vegetated than Qy3 tributary drainages. Soil development on Qy2 deposits is minor, characterized by incipient stage I calcium carbonate accumulation in the form of small filaments and medium brown (10 YR) surface coloration. Vegetation on Qy2 surfaces ranges from numerous small mesquite trees and grasses in distal fan environments to medium creosote, mesquite, acacia, agave, and cholla in tributaries and inset terraces. These surfaces are subject to inundation during moderate to extreme flow conditions when channel flow exceeds capacity or due to channel migration on low-relief portions of broad distal fan deposits. Planar Qy2 terraces are typically elevated from 30 cm to 1.5 m above active channels.

Piedmont deposits (continued)

Qy$_1$ — **Older Holocene alluvium** - Qy1 deposits consist of isolated, low-relief, undulating fan deposits, exhibit shallow braided drainage patterns, and sit higher in the landscape than younger Holocene alluvium. Vegetation consists of medium to large mesquite, yucca, agave, and tall range grasses. 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 (< 2m) Qy1 deposits overly more indurated, coarser Tsy deposits.

Qi$_3$ — **Late Pleistocene alluvial fan and terrace deposits** - Qi3 deposits are characterized as widespread planar reddish fan terraces mantled by angular to sub-angular pebbles to cobbles. These deposits exhibit moderate calcium carbonate accumulation (stage I-II) and soil development with reddish shallow subsurface coloration (7.5 YR 4/4). This color varies with position in the piedmont due to differences in parent material. Qi3 deposits exhibit medium (1-2 m tall) mesquite, cholla, prickly pear, creosote, acacia, and numerous small grasses and shrubs. Qi3 deposits stand up to 5 meters higher in the landscape than adjacent Qy1 and Qyc deposits depending on local incision and position within the piedmont.

Qi$_2$ — **Middle to late Pleistocene alluvial fan and terrace deposits** - Qi2 surfaces consist of broad planar fan terraces capping basin fill deposits, inset into older, more well-rounded alluvial deposits, or lining well incised piedmont drainages. These deposits generally exhibit reddish (7.5-5 YR 5/4) soils and moderate calcium carbonate accumulation (stage I-II+). Qi2 deposits are overall planar but can exhibit mild to moderate rounding near incised channels or inset terraces. Vegetation on Qi2 surfaces consists of medium mesquite, prickly pear, cholla, barrel cactus, and a thick cover of range grasses. Where incised, these deposits often exhibit a cap up to 1 meter thick of moderately calcium carbonate cemented clasts. This cap preserves underlying, less-indurated portions of the Qi2 surface as well as any deposits it may overly. Qi2 terraces deposited onto basin fil deposits may stand as much as 20 meters above active piedmont channels.

Basin fill deposits

Tc — **Late Miocene to Pliocene deposits** - Moderately to strongly consolidated conglomerate and sandstone deposited in basins during and after late Tertiary faulting. Includes lesser amounts of mudstone and siltstone. These deposits are generally light gray or tan. They commonly form high rounded hills and ridges in modern basins, and locally form prominent bluffs. Deposits of this unit are exposed widely in the dissected basins of southeastern and central Arizona. Vegetation throughout the mapped area consists of a dense grassy cover punctuated by medium to large mesquite, prickly pear, barrel cactus, and juniper. Juniper tend to be concentrated in incised drainages and north facing slopes. Long standing, broadly dissected Tc deposits exhibit a clay rich reddish cap evident in aerial photos and in roadcuts. In most cases this layer appears to be a product of in situ weathering of uppermost Tc sediments and not younger (Qi2 - Qi3) capping deposits. Tc deposits correlate to Gila Conglomerate deposits mapped in the Helvetia 7 1/2' quadrangle.

Bedrock

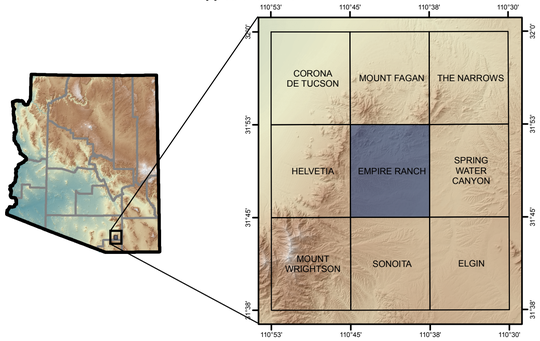
B — **Bedrock, undivided** - Undifferentiated bedrock

Map Symbol Descriptions

- Accurately located contact
- Approximately located contact
- Accurately located fault
- Approximately located fault
- Approximately located fault, inferred
- Fault concealed beneath surficial units

Location Map

Mapped area shown in blue



Topographic base from USGS 1:24,000 Quadrangle Series.
Seamless basemap generated using iGage All Topo Pro software.

Projection Information:
North American Datum of 1983.
1000-meter Universal Transverse Mercator grid tics, zone 12, shown in blue.

SCALE 1:24 000

1 0.5 0 1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 0.5 0 1 KILOMETER

CONTOUR INTERVAL 40 FEET

MN
10½°
2007 MAGNETIC NORTH DECLINATION

Arizona Geological Survey
416 W. Congress Street, Suite 100
Tucson, AZ 85701
(520) 770-3500
www.azgs.az.gov