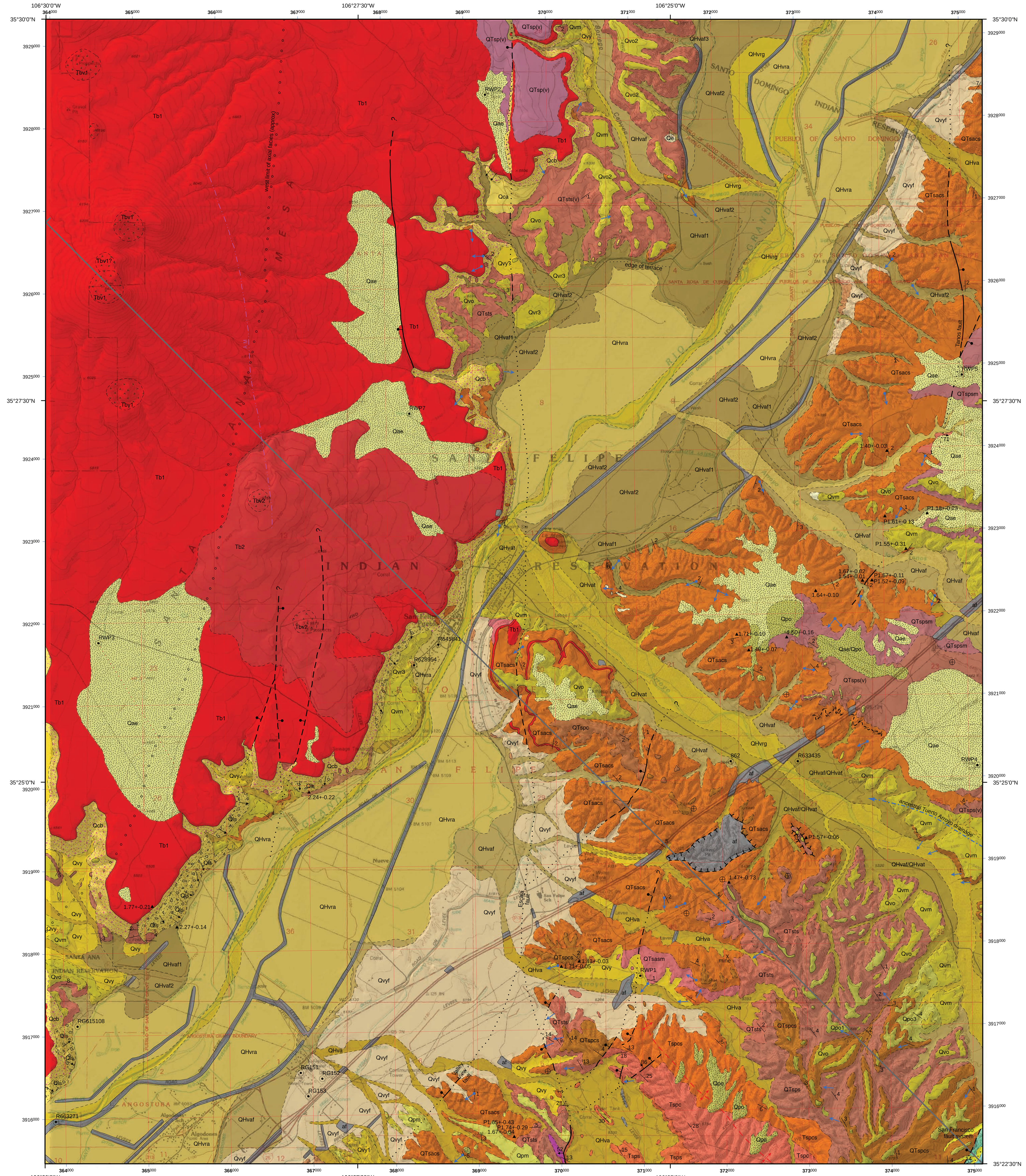
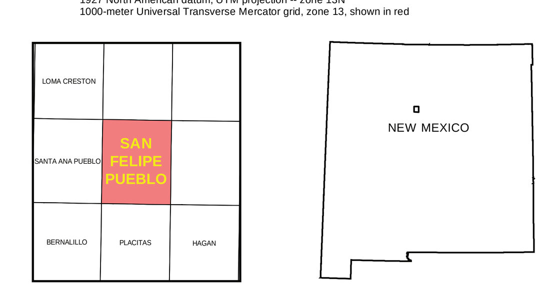
NEW MEXICO BUREAU OF GEOLOGY AND MINERAL RESOURCES A DIVISION OF NEW MEXICO INSTITUTE OF MINING AND TECHNOLOGY



Base map from U.S. Geological Survey 1984, from photographs taken 1976, field checked in 1976, edited in 1984.
1927 North American datum, UTM projection -- zone 13N
1000-meter Universal Transverse Mercator grid, zone 13, shown in red



QUADRANGLE LOCATION

Magnetic Declination
July, 2003
10° 17' East
At Map Center

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 20 FEET

NATIONAL GEODETIC VERTICAL DATUM OF 1929

This draft geologic map is preliminary and will undergo revision. It was produced from either scans of hand-drafted originals or from digitally drafted original maps and figures using a wide variety of software, and is currently in cartographic production. It is being distributed in this draft form as part of the bureau's Open-file map series (OFGM), due to high demand for current geologic map data in these areas where STATEMAP quadrangles are located, and it is the bureau's policy to disseminate geologic data to the public as soon as possible.

After this map has undergone scientific peer review, editing, and final cartographic production adhering to bureau map standards, it will be released in our Geologic Map (GM) series. This final version will receive a new GM number and will supercede this preliminary open-file geologic map.

DRAFT

New Mexico Bureau of Geology and Mineral Resources
Open-file Geologic Map 19

Mapping of this quadrangle was funded by a matching-funds grant from the STATEMAP program of the National Cooperative Geologic Mapping Act, administered by the U. S. Geological Survey, and by the New Mexico Bureau of Geology and Mineral Resources, (Dr. Peter A. Scholle, *Director and State Geologist*, Dr. J. Michael Timmons, *Geologic Mapping Program Manager*).

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This and other STATEMAP quadrangles are (or soon will be) available for free download in both PDF and ArcGIS formats at:

http://geoinfo.nmt.edu/publications/maps/geologic/ofgm/home.html

Geologic map of the San Felipe Pueblo quadrangle, Sandoval County, New Mexico

May 1998

by
S.M. Cather and S.D. Connell

New Mexico Bureau of Geology and Mineral Resources
801 Leroy Place, Socorro, NM, 87801

COMMENTS TO MAP USERS

A geologic map displays information on the distribution, nature, orientation, and age relationships of rock and deposits and the occurrence of structural features. Geologic and fault contacts are irregular surfaces that form boundaries between different types or ages of units. Data depicted on this geologic quadrangle map may be based on any of the following: reconnaissance field geologic mapping, compilation of published and unpublished work, and photogeologic interpretation. Locations of contacts are not surveyed, but are plotted by interpretation of the position of a given contact onto a topographic base map; therefore, the accuracy of contact locations depends on the scale of mapping and the interpretation of the geologist(s). Any enlargement of this map could cause misunderstanding in the detail of mapping and may result in erroneous interpretations. Site-specific conditions should be verified by detailed surface mapping or subsurface exploration. Topographic and cultural changes associated with recent development may not be shown.

Cross sections are constructed based upon the interpretations of the author made from geologic mapping, and available geophysical, and subsurface (drillhole) data. Cross-sections should be used as an aid to understanding the general geologic framework of the map area, and not be the sole source of information for use in locating or designing wells, buildings, roads, or other man-made structures.

The map has not been reviewed according to New Mexico Bureau of Geology and Mineral Resources standards. The contents of the report and map should not be considered final and complete until reviewed and published by the New Mexico Bureau of Geology and Mineral Resources. 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 State of New Mexico, or the U.S. Government.

QUATERNARY AND TERTIARY SYSTEMS

Valley-fill and valley-border alluvium

Variable proportions of stream and fan alluvium, locally containing debris-flow and colluvial deposits derived from adjacent slopes and upland areas. Stream- and arrouo-terraces are associated with major arroyos and streams originating in the Ortiz, Jemez and Sandia Mountains. Alluvial fans typically occur where relatively narrow low-order streams enter wider valleys. Deposits unconformably overlie basin fill and older rocks, and contain poorly to moderately stratified alluvium derived from local upland sources. Extrabasinal deposits contain volcanic and quartzite clasts derived from northern New Mexico. Intrabasinal deposits are dominated by sandstone, limestone, basalt, porphyritic intrusive, and granitic clasts.

Alluvium of the Rio Grande

QHvrg — Stream alluvium (historic) – Unconsolidated sand and gravel associated with the active channel of the Rio Grande.

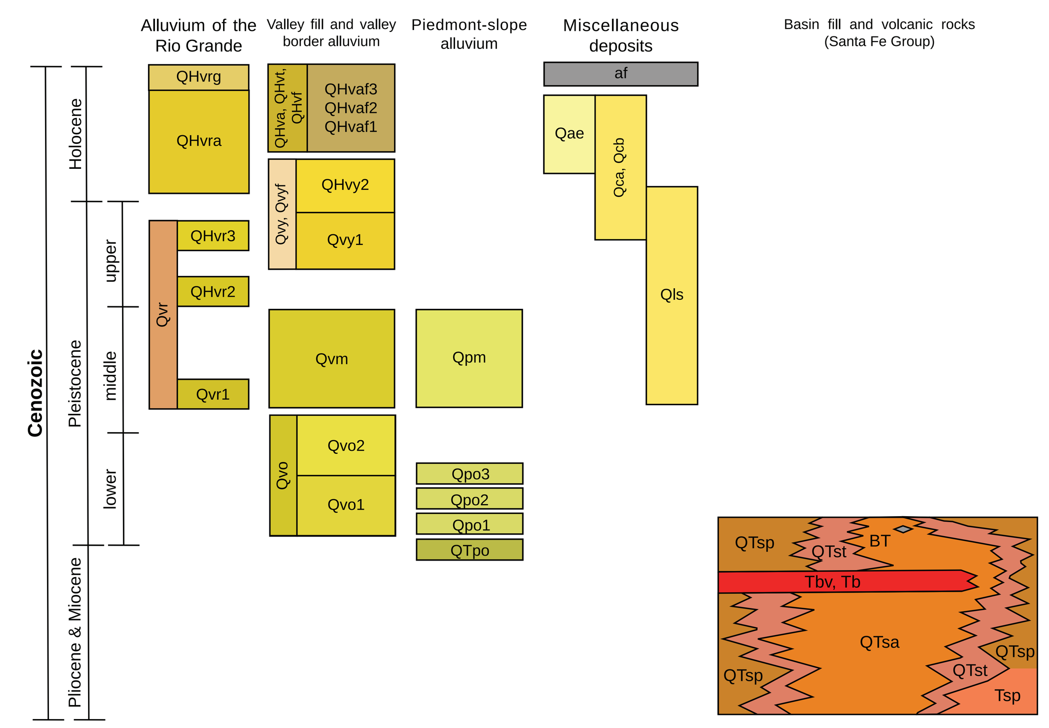
QHvra — Stream and floodplain alluvium (Holocene) – Unconsolidated fine- to coarse-grained sand, pebbly sand, silt and clay associated with the floodplain and abandoned channels of the Rio Grande. Drillers logs (Table 2) indicate that the base of this fluvial sequence is marked by a coarse gravel between 15 and 30 m beneath the land surface.

Qvr3 — Stream alluvium (upper Pleistocene) – Poorly to moderately consolidated deposits of rounded to subrounded pebble conglomerate and pebbly sand derived from the ancestral Rio Grande. Clasts are dominated by rounded quartzite pebbles with subordinate tuff, basalt, and granite. Pumice clasts of the (lower Pleistocene) Bandelier Tuff are rare. Unit forms discontinuous exposures along western margin of the Rio Grande valley. The base is poorly exposed and is about 12 m above the floodplain, at the southern margin of the quadrangle, and is buried by floodplain and fan alluvium to the north.

Qvr2 — Stream alluvium (upper Pleistocene) – Poorly consolidated deposits of yellowish-brown (10YR) pebble conglomerate and pebbly sand derived from the ancestral Rio Grande. Clasts are generally smaller than unit Qvr1. Unit may be correlative with the alluvium of Menaul Blvd. in the Albuquerque area to the south. Forms discontinuous exposures east of the inner valley escarpment of the Rio Grande. The top is about 50 m above the Rio Grande floodplain. Thickness is generally less than 4 m.

Qvr1 — Stream alluvium (middle Pleistocene) – Moderately consolidated and locally weakly indurated deposits of pale-brown to yellowish-brown (10YR) conglomerate, sand and sandy clay derived from the ancestral Rio Grande. Clasts are dominated by rounded quartzite cobbles and subordinate tuff, basalt, and granite. Clasts of lower Pleistocene Bandelier Tuff are rare. Deposits are typically overlain by Qpm and form laterally extensive outcrops along the southeastern margin of the Rio Grande valley, south of the study area. Unit is probably correlative with the alluvium of Edith Blvd., a prominent fluvial deposit in the Albuquerque area. The top of this deposit is about 42 m above the Rio Grande floodplain. Thickness is generally less than 8 m.

Preliminary Map-Unit Correlation: San Felip Pueblo 7.5-minute Quadrangle



Valley-floor and valley-border alluvium tributary drainage systems

QHva — Stream and piedmont alluvium, undivided (upper Holocene to historic) – Unconsolidated deposits of brown, light gray-brown, and yellowish-brown (7.5-10YR) sand, sandy clay loam and gravel. Bouldery alluviumis common along valley borders and adjacent to hillslopes underlain basaltic colluvium (Qcb). Unit is inset against Qvy and grades to the floodplain of the Rio Grande. Soils are nonexistent to very weekly developed and exhibit only trace accumulations of pedogenic carbonate. Unit is locally divided into terrace (QHvat) and fan (QHvaf) deposits on the basis of surface form, clast composition and stratigraphic (inset) position.

QHvat — Terrace alluvium (upper Holocene to historic) – Unconsolidated sequences of sand and silt-clay associated with the floodplain and low-lying terraces within high-order tributary drainages that grade to the Rio Grande. Unit is gernally less than 1 m above local base level.

QHvaf, QHvaf/QHvat: QHvaf1, QHvaf2, QHvaf3 — Fan alluvium (upper Holocene to historic) – Unconsolidated deposits of predominantly sand, silt and clast-supported pebble- to cobble-conglomerate. Unit commonly grades to QHva along valley borders and is divided into two subunits on the basis of inset relations. Typically forms fans along the base of entrenched tributary stream valleys, but locally includes valley-fill deposits in canyons upstream from fans. Clast composition reflects upland lithologic sources. Unit is divided into three subunits (youngest to oldest, QHvaf3, QHvaf2, and QHvaf1) on the basis of stratigraphic (inset) position.

Qvy: Qvy1, Qvy2 — Stream alluvium, undivided (upper Pleistocene through Holocene) – Poorly consolidated deposits of light-brown to light yellowish-brown (7.5-10YR) gravel and sand. Unit is inset against Qvm and possesses broad, very slightly dissected surfaces underlain by weakly developed soils that exhibit state I to II+ carbonate morphology. Clasts are commonly subangular to subrounded and range up to 2 m in diameter in lower Borrego Arroyo. Unit is associated with broad valley fill units within large tributary stream valleys. Unit is locally divided into older (Qvy1) and younger (Qvy2) subunits on the basis of stratigraphic (inset) position. Estimated thickness is about 12-18 m.

Qvyf — Fan alluvium, undivided (uppermost Pleistocene through Holocene) – Unit typically has fan-shaped morphology in map view. See description of Qvy.

Qvm — Stream alluvium (middle Pleistocene) – Moderately consolidated deposits of light-brown to light yellowish-brown (7.5-10YR) gravel and sand. Unit forms moderately dissected surfaces underlain by well developed soils with state III to IV carbonate morphology. Estimated thickness is 12 m or greater.

Qvo: Qvo1, Qvo2 — Stream alluvium (middle to lower(?) Pleistocene) – Moderately consolidated deposits poorly sorted, subangular gravel. The surface is moderately dissected and partially stripped. Unit occurs as thin (<3-m thick) straths at the heads of upland drainages and thickens to over 18 m within the valleys of major tributary drainages to the Rio Grande. Unit is locally divided into older (Qvo1) and (Qvo2) subunits on the basis of stratigraphic (inset) position.

Piedmont-slope alluvium

Complex juxtaposition of poorly to moderately sorted, poorly stratified, clast- and matrix-supported subangular- to subrounded-gravel and sand. Clast composition reflects lithology exposed in upland drainage basins and are commonly dominated by granite, metamorphic rocks, and limestone and sandstone.

Qpm — Piedmont alluvium (middle Pleistocene) – Moderately consolidated deposits of light- to strong-brown (7.5YR) and very pale-brown to light-gray (7.5-10YR) sand and gravel. Forms moderately dissected surface underlain by a moderately well developed soil possessing state III+ carbonate morphology. Multiple buried calcic (Bk) soils are locally recognized where inset against piedmont deposits of the Santa Fe Group. Estimated thickness is about 18 m.

Qpo — Old piedmont alluvium (middle to lower Pleistocene) – Moderately consolidated deposits of yellowish-brown (10YR), poorly sorted, subangular ot subrounded sand and conglomerate. Surface possesses erosional ridge-and-ravine topography. Surface is locally recognized by stripped soil exhibiting continuous to discontinuous (broken) carbonate rinds (ste III to IV carbonate morphology?). Unit is locally divided into three subunits (Qpo3, Qpo2, Qpo1) on the basis of inset relations along Tonque an San Francisco Arroyos.

QTpo — Old piedmont alluvium, undivided (middle to lower(?) Pleistocene) – Well consolidated ridge capping gravel on interfluves of Tonque and San Francisco Arroyo systems. Deposit surface is dissected. Unit thickness is estimated to be less than 10 m.

Artificial fill, landslide, and colluvial deposits

af — Artificial fill (Historic) – Dumped fill, excavations, and areas effected by human disturbances. Mapped where a really extensive (not mapped everywhere on quadrangle).

Qe — Eolian deposits (Holocene) – Yellowish buff fine to medium sands of eolian origin. Includes both active and semi-stabilized deposits.

Qae — Eolian and alluvial deposits, undivided (Holocene) – Poorly consolidated fine- to medium-grained sand and silty sand with scattered pebbles that commonly form a weakly to moderately developed desert pavement. Unit locally forms relatively thin (<1 m thick) mantle over the basalts of Santa Ana Mesa (Tb) and other upland areas.

Qcb — Basaltic colluvium (Holocene through upper Pleistocene) – Poorly consolidated and sorted breccia composed of angular to subangular basalt boulders derived from mesa-capping basalts along the margin of Santa Ana Mesa. Unit is a mantle of boulders that forms a transport-limited slope created by a combination of soil creep, rockfall and topple, debris flow, and landslide.

Qca — Colluvium and alluvium, undivided (Holocene through upper Pleistocene) – Poorly to moderately consolidated sand and gravel. Unit forms relatively thin (<2-m thick) mantle associated with base of steep slopes. Unit mapped where aerially extensive.

Qls — Landslide deposits (upper through middle Pleistocene) – Well consolidated and partially rotated blocks of gravity-transported basalt and Santa Fe group. Unit is recognized by surface morphology and exhibits a hummocky surface and bowl-shaped closed depressions at the head (top) of the unit. Unit Qvr and Qvr3 locally overlie landslide blocks. Two distinct generations of mass movement are recognized by nesting of bowl-shaped heads. Units transported during slope instability caused by local steepening of slopes during encroachment of the Rio Grande on the margin of Santa Ana Mesa. Arrows indicate direction of movement.

Volcanic rocks

Tb1, Tb2 — Basalt of Santa Ana Mesa (Pliocene) – Tholeiitic flood basalt with modal affinities to alkali olivine basalt (Kelley and Kudo, 1978, p. 9). Two flows (Tb1, Tb2) are differentiated using aerial photography, topographic relations, and number of flows exposed along edge of Santa Ana Mesa. Due to access restrictions, units are simplified and modified from the work of Kelley and Kudo (1978). Thickness is about 6-12 m along eastern margin of mesa and thickness to over 50 m west of the eastern edge of the mesa (Table 2). Bachman and Mehnert (1978) reported a K-Ar date of 2.5±0.3 Ma for this sequence of basalts. 40Ar/39Ar dates were obtained from a basalt flow (1.77±0.21) and a talus block (2.27±0.14 Ma) in sec. 35, T14N, R4E, and from another talus block in sec. 25, T14N, R4E (2.24±0.22; L. Peters, 1998, written commun.). Unit includes thin-bedded sequence of reddish-yellow (5YR), fine- to medium-grained phreatomagmatic deposits consisting of sandstone with interbedded 1- to 2-cm basaltic tephra. Unit underlies the basalt of Santa Ana Mesa and exhibits of dusky red (10R) color at the contact. Unit is 1-5 m thick and recognized in discontinuous exposures beneath Tb1 east of San Felipe Pueblo and along eastern margin of Santa Ana Mesa except in the southern part of the quadrangle.

Tbv1, Tbv2 — Basaltic vent (Pliocene) – Two vent ages (Tbv1, Tbv2) are distinguished on the basis of relations with flows. Conical-shaped vents rise above laterally extensive, low relief flood basalts of Santa Ana Mesa. Cones are differentiated by morphologic variations using aerial photography. The locations of units are modified from the work of Kelley and Kudo (1978).

Basin-Fill Deposits

Upper Santa Fe Group (Pliocene(?) – Pleistocene)

The Santa Fe Group consists of axial and piedmont deposits related to deposition within the Santo Domingo Basin prior to valley incision. For the purposes of mapping, these units were divided on the basis of textural criteria and dominantly volcaniclastic versus dominantly non-volcaniclastic nature using the method of Cather (1997), as well as into lower and upper units on the basis of induration, stratal dip, and geochronology. The San Felipe Pueblo quadrangle contains deposits representative of three ancint depositional systems. A western piedmont system (QTsp(g), QTsp(v)) locally crops out west of the Rio Grande and consists largely of volcaniclastic material derived from the Jemez Mountains to the northwest and lesser amounts of nonvolcanic material (red granite, quartzite, chert) derived from the Sierra Nacimiento and San Juan Basin areas to the west. The proportion of non-volcanic material within western piedmont deposits transitionally increases southward within the quadrangle; only locally in the north near Borrego Canyon do these deposits consist exclusively of volcaniclastic detritus (QTsp(v)) and thus may be regarded as Cochiti Formation (sensu Smith and Lavine, 1996).

The axial fluvial system (QTsacs, QTsas, QTsasm) consists of weakly indurated sand, gravel and mud of the ancestral Rio Grande. West of the modern Rio Grande gravels contain a considerable amount of volcanic detritus derived from the Jemez Mountains; east of the river quartzite predominates. Textrual subdivision of the axial fluvial system is quite approximate because of poor exposure quality. These units constitute the most implrtant aquifer in the study area. Paleoflow was generally south or southwest. The axial fluvial system contains numerous ashes, thepras, and pumice clasts; radioscotopic dates are presented in Table 1. Azial deposits and associated piedmont deposits in areas to the south are termed the Sierra Ladrones Formation.

The eastern piedmont system (QTspc, QTspcs, QTsps, QTspsm, Tspc, Tspcs, Tsps) consists predominantly of recycled sedimentary detritus from Paleozoic and Mesozoic strata. Proterozoic granitic, quartizitic, and metamorphic detritus are also present, in increasing in abundance in the southeast part of the quadrangle. Volcaniclastic detritus is minor (<10%) and consists of materials reqorked from the Espinaso Formation. Paleoflow in the eastern piedmont was generally west or southwest.

In areas where intercalated in a manner in which they cannot be separated at a scale of 1:24,000, interfingered piedmont and axial deposits are mapped as transitional deposits (QTsts, Cather, 1997). QTsts(v) in the north-central part of the quadrangle consists predominantly of volcanic-bearing axial sands and gravels and subordinate volcaniclastic piedmont deposits.

QTsacs — Axial fluvial deposits consisting of subequal proportions of gravel (pebbles, cobbles) and sand. Weakly indurated; medium to light gray in color. Gravels are quartzite-dominated and well rounded; sands are quartzose and commonly crossbedded. Gravel-clast lithologies included quartzite, chert, granite, sandstone, intermediate volcanics and pumice. Mudstone is minor and is reddish brown to grayish green in color. Bedding thickness is 0.5 to 4 m.

QTsas — Light gray sandstone-dominated axial fluvial deposits. Mapped separately only in local area north of Arroyo de la Vega de los Tanos. Sandstones are weakly indurated and trough cross-bedded.

QTsasm — Axial fluvial deposits consisting of subequal sandstone and mudstone with minor conglomerate. Unit occurs locally approximately 1 km east of San Felipe Pueblo. Anamalous mudstone content may reflect development of sag ponds on hanging wall of Escala fault.

QTsts — Sandstone-dominated transitional piedmont-axial deposits. Unmappably intercalated reddish brown to buff piedmont deposits and gray axial fluvial deposits. Conglomerate and mudstone (Both axial and piedmont) are commonly present but volumetrically subordinate. Bedding thickness is typically 0.1-1 m.

QTsts(v) — Sandstone-dominated transitional volcanic-bearing piedmont-axial deposits. Intercalated piedmont and axial deposits in the north-central part of the quadrangle that contain abundant Jemez-derived volcanic clasts. Piedmont deposits comprise only a minor component in most areas.

QTspcs, QTspcs(v) — Eastern piedmont facies consisting of subequal conglomerate and sandstone with minor reddish brown mudstone. Conglomerate clasts consist mostly of recycled Paleozoic and Mesozoic sedimentary detritus with subordinate clasts derived from Espinaso volcanics. Conglomerate-clast lithologies are similar to QTspc. Sandstones are commonly crossbedded and texturally and mineralogically submature, and form beds that are tabular in shape 0.3-2 m thick. Moderately indurated.

QTsps — Sandstone-dominated eastern and western piedmont facies. Conglomerate and mudstone are commonly present in subordinate amounts. Sandstones are light reddish brown, texturally and mineralogically submature, and coarse to fine grained. Beds are tabular and 0.1-1.0 m thick. Moderately to weakly indurated.

QTspsm — Eastern piedmont deposits consisting of subequal sandstone and mudstone. Sandstones are similar to QTsps. Mudstones are weakly indurated and medium reddish brown. Bedding is 2 cm to 1.5 m thick. Weakly developed calcareous paleosols are common.

QTsp(v) — Western piedmont deposits (Cochiti Formation) overlying Tb1 on Santa Ana Mesa in north part of quadrangle. Unit consists of poorly consolidated gravels and sands but is not sufficiently exposed to allow subdivision into textural lithofacies. Pebbles and cobbles are volcanic (mostly mafic to intermediate composition) and are subangular to subrounded. Unit ranges from 0 to 20 m thick.

Lower Santa Fe Group (Miocene(?) – Pliocene(?))

Tspc — Eastern piedmont facies consisting dominantly of conglomerate with subordinate sandstone. Clasts are composed predominantly of Paleozoic and Mesozoic sedimentary detritus; Proterozoic lithologies are also well represented, particularly in the southeast part of the quadrangle. Unit is moderately to well indurated, moderately dipping, and occurs stratigraphically below the lower Bandelier ash and pumice deposits to the north, and is thus thought to be pre-Quaternary in age. Volcanic detritus (rcycled Espinaso Formation) is a common but typically minor constituent. Bedding is channel-form to tabular and typically 0.3-2 m in thickness.

Tspcs — Eastern piedmont facies consisting of sandstone and conglomerate. Conglomerate is similar to that in Tspc and forms beds 0.5-2.0 m thick. Sandstone is fine to very coarse grained and is buff to pale reddish brown.

Tsps — Sandstone-dominated deposits at eastern piedmont facies. Buff to light reddish brown fine to coarse sandstones with subordinate conglomerate and mudstone. Bedding is typically 0.1-1.0 m thick.

Mesozoic System

Jt — Toldito Formation – Light olive gray, laminated, fetid limestone overlain by light gray massive gypsum. Locally the Todilto is about 65 m thick, although only fault slivers along the San Francisco fault zone are present in the extreme southeast corner of the quadrangle.

Je — Entrada Sandstone – Yellowish gray eolian sandstones and reddish brown silty sandstones. Unit is about 40 m thick nearby to the east (Lucas et al., 1995); only fault slivers are present in the southeast art of the quadrangle.

Ʀc — Chinle Group – Reddish gray to purplish gray to grayish green mudstone and sandstone. Regionally about 300-400 m thick.

Preliminary Geologic Cross Section of the San Felipe Pueblo Quadrangle