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

3913⁰⁰⁰ 35°20'0"N 35°17'30"N -107°35'0"W 107°32'30"W 35°15'0"N

Map Unit Descriptions

Alluvium - Deposits of sand, gravel and silt in main valley bottoms; locally includes stream terraces, alluvial fans, and canyon wall colluvium; valley floor alluvium is typically finer-grained, silt and sand dominated deposits with interbedded gravel beds, whereas low terrace deposits are predominantly sand and gravel. Qal is mostly Holocene in age; maximum thickness of various alluvium deposits is uncertain but may exceed 15 m. young to fit stratigraphy and dates of other units. Maximum observed thickness is about 70 m. Colluvium—Poorly sorted slope wash and mass wasting deposits from local sources; mapped only where

Eolian deposits—Windblown and sheet wash deposits of silt and fine sand 0.2 to greater than 1 m thick

Terrace deposits—Deposits of sandy pebble to boulder size gravel underlying terrace surfaces located approximately 5 to 15 m above local base level; mapped only in upper Salazar Canyon; deposits are only

extensive or where covering critical relations; thickness can locally exceed 15 m.

considerably depending on the size and nature of the landslide. Alluvial fans—Typically fan-shaped deposits of coarse to fine gravel and sand, silt, and clay within and at the mouths of valleys; associated with present drainages and usually not incised; grades into alluvial deposits along main channels; probably Holocene to middle Pleistocene in age; occasionally subdivided into young (Qafy) and

Landslides-Poorly sorted debris that has moved chaotically down steep slopes; slumps or block slides

partially to completely intact, that have moved down slope; slumps and block slides usually display some

rotation relative to their failure plane; ages vary from Holocene to mid- to late-Pleistocene; thicknesses vary

Volcanic Rocks of Mount Taylor, Southern Mesa Chivato and Vicinity

old (**Oafo**) fans; maximum exposed thickness about 15 m.

Younger very aphyric trachybasalt—Youngest cone and flows erupted from the Cerro Pelón complex; consist of blue-gray to black, fine-grained hawaiite and red to black cinder deposits (Qyatc) having very tiny sparse olivine phenocrysts and sparse quartz xenocrysts in intersertal to slightly vesicular groundmass. Microphenocrysts consist of plagioclase, clinopyroxene, minor olivine, opaque oxides and very tiny, sparse titaniferrous biotite in glass. Cone contains two dikes (Qyatd) the most prominent of which trends northwest. Flows overlie units **Tbd**, **Qytb**, **Tymtb**, **QTvs** and **Tbta**. Sample of flow west of cone has 40 Ar/ 39 Ar age of 1.26 ±

Younger quartz-bearing trachybasalt—Two cone and flow complexes. The southern complex consists of black to gray, fine-grained hawaiite and red to black cinder deposits (Qyqtc) having sparse olivine phenocrysts and extremely rare quartz xenocrysts. Cone and flow apparently underlie unit Qyatb but overlie unit Tymtb in Cerro Pelón complex. Flows extend to NE along Seboyetita Creek. The northern complex consists of gray, medium-grained hawaiite and black to red cinder deposits (Qyqtc) containing small olivine phenocrysts and sparse quartz xenocrysts in intersertal groundmass. Microphenocrysts consist of plagioclase, clinopyroxene, olivine, orthopyroxene and opaque oxides in glass. Flow apparently originates from summit of cinder cone. Flow apparently overlies unit Qyptb immediately to east and unit Qyxtb to west. Flow overlies unit QTvs. Lava from southern flow has 40 Ar/ 39 Ar date of 1.53 ± 0.07 Ma. Maximum exposed thickness of flows is \leq 35 m.

Younger medium-grained trachybasalt—Cone and flow complex straddling upper Spud Patch Canyon in SW part of quadrangle; consists of gray to black flows and red to black cinder deposits (Qyhc) of hawaiite containing sparse phenocrysts of plagioclase, rare phenocrysts of black augite and sparse xenocrysts of quartz in dense, medium-grained trachytic groundmass; several short, north-trending dikes (Qyhd) are exposed in

canyon wall east of cinder cone; overlies unit **Qyxtb**; unit not dated; maximum exposed thickness about 80 m.

Younger aphyric trachybasalt—Cone and flow complex between American and Colorado canyons in south-central quadrangle; consists of dark gray flows and black to red cinder deposits (Qatc) of basalt with rare phenocrysts of plagioclase, tiny olivine, and rare quartz xenocrysts; cone deposits contain beautiful assortment of spindle bombs; overlies units Qytb, Qyxtb and QTvs; dense bomb from one cone has 40Ar/39Ar date of 1.76 ± 0.05 Ma; maximum observed thickness about 60 m.

Younger medium-grained plagioclase trachybasalt—Gray to black flows and red to black cinder deposits **npc**) of medium-grained basalt containing small, platy, interlocking microphenocrysts of plagioclase and tiny microphenocrysts of olivine and clinopyroxene; cinders contain rare fragments of Cretaceous sandstone; cone has young, conical shape; overlies **Qyopb**. Unit is not dated. Maximum observed thickness is about 60 m.

Younger fine-grained olivine trachybasalt—Single cone and flow complex in south central quadrangle east of American Canyon; consists of dark gray flow and black to red cinder deposits (Qyfoc) of fine-grained basalt with abundant tiny phenocrysts of olivine; small closed depression on NE side of cone may be lava vent; overlies units **Qytb** and **Tyocb**; unit is not dated; maximum exposed thickness is ≤50 m.

Younger trachybasalt—Three cone and flow complexes in south central quadrangle east of American Canyon, which includes Cerro Osha. Consists of black to dark gray lavas and black to red cinder deposits (Qytc) of relatively aphyric basalt with rare, very tiny phenocrysts of plagioclase ± olivine; two northern cones contain NE-trending dikes (Qytd); overlies units Qyptb, Tbta, QTvs and Qycob; overlain by Qyfob. The unit Qytb also includes a sequence of flows in NE corner of quadrangle that overlie Qycopb and apparently overlie Qftb.

Various units are not dated and flows are ≤60 m thick.

Younger spotted trachybasalt—Gray to black lava flows and red to black cinder deposits (Qystc) of distinctive, spotted hawaiite containing rare phenocrysts of plagioclase ≤1 cm long, and rare tiny phenocrysts of olivine. The spots appear to be clots of plagioclase microphenocrysts aligned parallel to flow foliations. Overlies Qyftb, **Qyopb**, **Qypob**, **Tymtb** and **Tyocb**. Unit is not dated. Maximum observed thickness is about 120 m.

Younger xenocrystal trachybasalt—Five cinder cone and flow complexes in southern and eastern map area consisting of black to gray, medium- to fine-grained hawaiite and red to black cinder deposits (Qyxtc) having very sparse phenocrysts of olivine, plagioclase, and augite and very rare xenoliths of mantle peridotite and extremely rare fragments of gabbro. Some specimens contain rare quartz xenocrysts; cinder deposits may contain bombs of trachyandesite, trachydacite, and Cretaceous sandstone. Two cones contain NE-trending dikes (Qyxtd). Lavas flowed to east, north and west. Flows overlie units QTvs, Tpetd, Toptb, Tvst, Tsptd, and Trt. Flows underlie Qyh, Qatb, and Qyqtb. Flow from cone near SW edge of map has 40 Ar/ 39 Ar date of 1.74 ± 0.03 Ma (McCraw et al., 2009). Flow on Mesa La Cuchilla in NW corner of map has 40 Ar/ 39 Ar date of 1.79 ± 0.05 Ma. Flow from cone in SE part of map has ${}^{40}\text{Ar}/{}^{39}\text{Ar}$ age of 1.85 ± 0.06 Ma. Maximum thickness of flows is ≤ 60 m.

Younger olivine plagioclase trachybasalt—Two cinder cone and flow complexes in central and eastern parts of quadrangle consisting of gray to black, slightly porphyritic lavas and red to black cinder deposits (Qyopc); both cones contain NE-trending dikes (Qyopd). Specimens are relatively aphyric containing tiny rare phenocrysts of olivine ± clinopyroxene, and sparse small phenocrysts of plagioclase. The more northerly of the two cones contains rare fragments of gabbro and Cretaceous sandstone. Overlies Qyptb, Qypob, and QTvs; underlies **Qytb**, **Qyfpb** and **Qystb**. Unit is not dated. Maximum observed thickness is about 60 m.

a felted groundmass of very fine-grained plagioclase, clinopyroxene, and minor olivine. Flows originate from unidentified source ENE of the quadrangle. Overlies Qycopb and Qyob; apparently underlies Qytb. Sample of flow has ${}^{40}\text{Ar}/{}^{39}\text{Ar}$ age of 2.28 ± 0.07 Ma. Maximum observed thickness is about 10 m. Younger porphyritic pyroxene olivine basalt—Gray to black flows of very distinctive, speckled, medium to

Younger fine-grained plagioclase trachybasalt — Light gray flows of aphyric, aphanitic trachybasalt containing

course-grained porphyritic basalt containing abundant phenocrysts (5-15%) of anhedral to resorbed black clinopyroxene (≤4 mm), green anhedral olivine (≤5 mm) and clear to white, zoned subhedral plagioclase (≤5 mm). Olivine is commonly iddingsitized and frequently rimmed or intergrown with clinopyroxene. Specimens generally contain a trace amount of xenocrystic quartz. Overlies **Tvst** and **Qyob**; underlies **Qftb** and Qytb; source is east of quadrangle. Sample of flow has 40Ar/39Ar age of 2.31 ± 0.06 Ma. Maximum observed

Younger plagioclase olivine trachybasalt—Gray to black flows and red to black cinder deposits (Qypoc) of distinctive, medium-grained basalt containing abundant white, blocky plagioclase (≤4 mm), pale green anhedral olivine (≤3 mm) and sparse black clinopyroxene (≤1 mm) phenocrysts. The olivine is commonly iddingsitized. Large cone contains two, long NNE-trending dikes (Qypod) composed of finer grained but petrographically similar trachybasalt. Overlies Tvst, Qyob and Qyptb; underlies Qyopb and Qympb. Sample of flow has 40 Ar/ 39 Ar age of 2.29 ± 0.06 Ma. Maximum exposed thickness is about 100 m.

Younger gabbro-bearing plagioclase trachybasalt—Gray, medium to fine-grained hawaiite and black to red cinder deposits (Qyptc) containing sparse small phenocrysts of plagioclase and black clinopyroxene; contains rare, resorbed quartz xenocrysts (≤10 mm), and locally abundant, resorbed gabbroic (plagioclase plus clinopyroxene) xenoliths (≤20 mm). Two small puddles of lava occur within the cone complex in center of quadrangle; a northeast trending slope of unit QTvs is exposed within the flows; cone and flows apparently underlie unit Qyqtb to west and underlie units Qyopb and Qypob to east; overlies unit Tvst; sample of lava from the cone complex has 40 Ar/ 39 Ar age of 2.30 ± 0.13 Ma; maximum exposed thickness of flows is <25 m.

Younger olivine trachybasalt—Gray to black flows and red to black cinder deposits (Qyoc) of fine-grained basalt containing 2-4% resorbed olivine phenocrysts (≤5 mm) of uniquely translucent green color. The olivine is commonly iddingsitized. Felted groundmass contains abundant plagioclase and olivine microphenocrysts. The cone contains a NNE-trending dike (Qyod). Specimens on the cone are finer grained and also contain conspicuous resorbed plagioclase and clinopyroxene megacrysts. Overlies Tvst and apparently Totb; underlies **Qypob**, **Qftb** and **Qcopb**. Sample of flow has 40 Ar/ 39 Ar age of 2.18 ± 0.06 Ma, but age seems too

Younger fine plagioclase trachybasalt—Gray, medium- to fine-grained basalt and black to red cinder deposits (Qyfpc) having sparse tiny plagioclase and rare tiny olivine phenocrysts. Lava specimens often have felted appearance. Eroded cone, which lies immediately east of Cerro Osha overlies layer of poorly exposed gabbro (Tgab). Dike of Qyfpd cuts flow just south of cone. Overlies Tyocb; underlies Qytb, Qystb and Qyqtb. Sample of dense bomb fragment in cone has 40Ar/39Ar age of 2.37 ± 0.14 Ma. Maximum exposed thickness in cone is about 150 m.

Tertiary (Pliocene)

exposed thickness is about 50 m.

Volcaniclastic sedimentary rocks—Gray to tan to white debris flows, fluvial deposits and interbedded tuffs (Tvst) shed from the Mount Taylor stratovolcano during growth. Debris flow component is most abundant near source (south and southwest parts of quadrangle) and consists primarily of boulders and cobbles of angular to subangular trachydacite and trachyandesite in a volcanic sand matrix. Boulders form a lag deposit on surface of debris flows. Fluvial component contains rounded to subrounded cobbles including a higher proportion of basaltic clasts, especially to north. Tuffs consist mostly of thin beds and lenses of fall deposits with vesiculated pumice having phenocrysts of plagioclase, clinopyroxene ± hornblende ± biotite. Underlies a multitude of mafic flows and cones north of Mt. Taylor and in this area extends into the Quaternary; underlies several intermediate composition flows and domes on upper north flank of Mt. Taylor. Overlies a few older, often poorly exposed trachybasalts and intermediate composition rocks throughout the quadrangle; overlies Cretaceous Menefee Formation in lower San Mateo Canyon. Maximum exposed thickness is >200 m.

Porphyritic "Spud Patch" trachydacite — Composed of two map units. The basal unit (Tsptdl) is gray, porphyritic, glassy lava with 15-20% phenocrysts of plagioclase, pyroxene, hornblende and biotite with angular to rounded enclaves. The basal unit weathers to an orange-brown color and forms prominent cliffs. The basal unit is overlain by light gray porphyritic trachydacite (Tsptds) having phenocrysts of plagioclase, pyroxene, hornblende and biotite, and angular to subrounded enclaves of reddish gray lava set in a sugary matrix. The upper unit weathers to an orange-brown color and erodes into spires. The upper unit of the Spud Patch flow thickens to the north. The contact between the two units is gradational over 1 to 2 m. Contains plagioclase-clinopyroxene-biotite enclaves. The enclaves have a lower phenocryst content (<10%) compared to the matrix. Plagioclase, minor Kspar, clinopyroxene, orthopyroxene, oxidized hornblende and biotite, and opaque oxides have been identified petrographically. Texture is porphyritic, hyalopilitic, and devitrified. Microphenocrysts consist of plagioclase and minor clinopyroxene. Overlies QTvs. Vent for "Spud Patch" lavas is apparently eroded away. Lower unit of Tsptd has 40 Ar/ 39 Ar age of 2.53 \pm 0.06 Ma. Maximum exposed thickness roughly 200 m.

Younger megacrystal trachybasalt—Two cinder cone and flow complexes. One complex constitutes the oldest flow and cone within the Cerro Pelón area in south central portion of quadrangle; consists of black to gray, fine-grained hawaiite and red to black cinder deposits (Tymtc) having rare megacrysts of augite and olivine. Partially eroded cone contains two northeast trending dikes (Tymtd). Texture is intersertal to slightly trachytic. Microphenocrysts consist of plagioclase, clinopyroxene, minor olivine and opaque oxides in glass. Overlies units Tbtd and Tbta. Second complex sits near east central edge of map and consists of a single small flow of gray, fine-grained hawaiite and black to red cinder deposits (Tymtc) containing megacrysts of augite and olivine. Lava in Cerro Pelón area has 40 Ar/ 39 Ar date of 2.64 ± 0.10 Ma. Thickness of flows is <30 m.

Younger olivine-rich basalt—Black to gray basalt with conspicuous olivine, plagioclase and clinopyroxene phenocrysts. Texture is intersertal. Groundmass contains plagioclase, olivine, augite, opaque oxides, and glass. Olivine shows iddingsite alteration. Flows originate from eroded, poorly exposed cone of red to black cinders (Tyocc) northeast of Cerro Osha, cut by NNE-trending dike (Tyocd). Overlies Tbta; underlies Qytb, Qyfob and **Qyfpb**; cut by dike of **Qyfpd**. Sample of flow northwest of cone has 40 Ar/ 39 Ar age of 2.67 \pm 0.12 Ma. Maximum

Gabbro – Gray, fine-grained gabbro containing about 70% plagioclase, 30% black, blocky clinopyroxene and rare tiny olivine; forms layer on lower north side of cone (Tytpc) described above but is a shallow sill or

Trachyandesite — Vent and short flow of gray to black, porphyritic lava in the southern quadrangle. Phenocrysts consist of resorbed plagioclase, oxidized clinopyroxene, hypersthene ± rare olivine and magnetite in a pilotaxitic groundmass containing microphenocrysts of plagioclase, clinopyroxene, apatite, opaque oxides, and devitrified glass. Specimens show minor Fe-oxide alteration. Overlies unit Tbhd in southern part of map. Flow not dated. Exposed thickness is ≤100 m.

crystallized core of **Tyocb**. 40 Ar/ 39 Ar age is 2.68 ± 0.07 Ma; maximum exposed thickness roughly 25 m.

Hornblende trachydacite - Massive to sheeted flow of porphyritic trachydacite containing phenocrysts of plagioclase, clinopyroxene, and minor hornblende; overlies older plagioclase basalt (Toptb) near SW corner of map. Also overlies volcaniclastic sedimentary deposits (QTvs) and units Tbta and Tpbtd. Flow not dated. Exposed thickness is nearly 200 m.

Porphyritic biotite trachydacite—Gray to yellow brown, massive to sheeted, porphyritic trachydacite lavas containing phenocrysts of Kspar, plagioclase, clinopyroxene, and biotite in granular to trachytic, devitrified groundmass. Microphenocrysts consist of Kspar, plagioclase and opaque oxides. Contains rare orthopyroxene with clinopyroxene jackets; contains rare enclaves of plagioclase-pyroxene-biotite. Unit contains prominent, NNW-trending plug (and dike?) complex (Tpbti) of strongly foliated and sheeted trachydacite atop which are several microwave towers (Mosca Peak). Overlies units QTvs, Tpta, Tbta, Tbtac and Tsetd. Sample of intrusion has ${}^{40}\text{Ar}/{}^{39}\text{Ar}$ age of 2.71 \pm 0.03 Ma. Maximum exposed thickness about 500 m.

Porphyritic biotite hornblende trachydacite—Gray to reddish gray, massive to sheeted, porphyritic trachydacite lavas containing phenocrysts of plagioclase (some sieved), clinopyroxene, biotite, hornblende, rare quartz, rare Kspar, and opaque oxides in a trachytic to hyalopilitic, devitrified groundmass; microphenocrysts consist of tiny plagioclase, sparse clinopyroxene and opaque oxides. At least two N-trending dikes of this unit are exposed in north amphitheater wall on south edge of quadrangle. Overlies units **Tpta** and **Tbtd**; underlies small eruption of **Tta**. Unit is not dated. Maximum exposed thickness about 335 m.

Porphyritic biotite trachydacite—Gray to yellow brown, massive to sheeted, porphyritic trachydacite lavas containing phenocrysts of Kspar, clinopyroxene, rare quartz, oxidized biotite, sparse oxidized horneblende and opaque oxides in intergranular, devitrified groundmass; microphenocrysts consist of Kspar, quartz and opaque oxides. Overlies units **Tbtd** and QT**vs**; overlain by unit **Qyatb**; unit not dated; maximum exposed thickness about 350 m.

Porphyritic basaltic trachyandesite—Gray to tan, massive, porphyritic basaltic trachyandesite lavas containing phenocrysts of clinopyroxene, plagioclase and rare olivine; overlies and intrudes Tbtd; unit not

dated; maximum observed thickness about 110 m.

Porphyritic trachyandesite, undivided—Brownish gray to black, massive to sheeted, porphyritic lavas having phenocrysts of plagioclase, clinopyroxene, rare olivine, and opaque oxides in an intersertal to slightly vesicular groundmass; microphenocrysts consist of plagioclase, clinopyroxene, and opaque oxides in devitrified glass; plagioclase is complexly zoned and sieved; displays minor clay and Fe-oxide alteration. Underlies units Tpbtd, interbedded with **Tbhd**, overlies **Tbtd**, intruded by **Tcptd**. Sample of lava from amphitheater rim has ⁴⁰Ar/³⁹Ar age of 2.63 ± 0.07 Ma; maximum exposed thickness about 330 m.

Slightly porphyritic biotite trachydacite—Multiple, often platy flows of pale gray slightly porphyritic lavas occurring along the south margin of the quadrangle; contains 2-4% phenocrysts of small, blocky plagioclase, biotite, and clinopyroxene. Underlies Tpbtd, Tbd and Tymtb; interbedded in Tpta; intruded by Tbhd and Tpbdi; overlies QTvs and Tpbta. Unit is not dated. Maximum observed thickness is about 215 m.

Porphyritic enclave-bearing trachydacite—Thick, multiple flows of dark gray to tan porphyritic lavas having conspicuous enclaves up to 50 cm in diameter, especially in the lower flows. Lava contains phenocrysts of large potassium feldspar, plagioclase, clinopyroxene, orthopyroxene and biotite in an intergranular to hyalopilitic groundmass of plagioclase, potassium feldspar, clinopyroxene and devitrified glass. Groundmass contains sparse phenocrysts (?) of quartz. Enclaves consist of potassium feldspar, plagioclase, clinopyroxene, orthopyroxene, magnetite, and vesiculated glass. Underlies Qyxtb, QTvs and Thtd; overlies Tcptd. Flow just west of quadrangle boundary has 40 Ar/ 39 Ar date of 2.68 ± 0.09 Ma. Maximum exposed thickness about 250 m.

Tuffs of San Mateo Canyon—White to gray, bedded tuffs and tephras of rhyolite to trachydacite composition with interbedded volcaniclastic sands and gravels. Tuffs consist of pyroclastic fall and flow deposits no more than 4 m thick. Two of the tuffs are continuously exposed in San Mateo Canyon. The basal rhyolite tuff is lithic poor and probably correlates with a similar looking ignimbrite in Water Canyon, Mount Taylor quadrangle. A tuff near the middle of the San Mateo Canyon sequence contains 10-20% lithics. The lithic fragments consist of trachytic lavas. Tuffs near the top of the sequence are thin and discontinuous, and contain 5-10% lithic fragments. Generally occurs within bottom half of QTvs. Unit as mapped may contain a few meters of Grant's Ridge tuff (**Tgrt**) at very bottom (see below).

Trachydacite tuff—Light gray to pinkish gray to pale tan pumice and ignimbrite in middle to upper half of QTvs sequence; phenocrysts consist of plagioclase, clinopyroxene, biotite ± hornblende in a eutaxitic groundmass. Pumice lump from ignimbrite in middle Salazar Canyon on west side of quadrangle has 40Ar/39Ar age of 2.79 ± 0.09 Ma. Pumice fall deposit in unit **Tvst** along FS 239, north edge of map, has 40 Ar/ 39 Ar age of 3.04 \pm 0.12 Ma. Maximum exposed thickness is \leq 15 m.

Rhyolite tuff—White to light gray pumice in bottom of Tvst sequence; phenocrysts consist of potassium feldspar, plagioclase, minor clinopyroxene, quartz, and biotite in a eutaxitic groundmass. Sample from fall deposit just west of the quadrangle has 40 Ar/ 39 Ar age of 3.08 ± 0.20 Ma (McCraw et al., 2009). Maximum exposed

Landslide deposit—This unsorted unit is mappable in the upper reaches of Marquez Canyon. This deposit consists of angular trachydacitic blocks that are 3-4 m (car-sized) in diameter on top of boulder to cobble sized volcaniclastic debris. The Tertiary landslide is intercalated within the **Tvst** interval. The deposit is overlain by one of the tephras related to the tuffs of San Mateo Canyon and is topographically above a basalt flow interpreted to be **Totb**. The landslide is 6 to 12 m thick.

Trachydacite - Light gray lava exposed in extreme SE corner of quadrangle; 15 to 20% crystals of biotite, plagioclase, hornblende, and sparse quartz. The plagioclase laths are 2 to 8 mm long. Megacrysts of pyroxene occur in a few outcrops. A 1 to 2 m thick, poorly exposed tephra with pumice lapilli up to 15 cm in diameter is discontinuously preserved at the base of the trachydacite. The lava underlies 1 to 30 m of tuffaceous volcaniclastic sediments (Tvst). Unit is interbedded in QTvs. Unit is not dated and maximum exposed

Tbta/Tbtac—Porphyritic basaltic trachyandesite, undivided—Gray, massive to sheeted, slightly porphyritic lavas containing phenocrysts of plagioclase, clinopyroxene and olivine in a trachytic to hyalopilitic, devitrified groundmass; microphenocrysts consist of plagioclase, clinopyroxene and opaque oxides; may contain rare quartz xenocrysts; may contain plagioclase-pyroxene-olivine clots; some exposures show minor Fe-oxide oxidation and weathering. Eroded cone of **Tbtac** may be source of some flows. Overlies **Toptb** and **Tsetd** in SW map area; apparently underlies QTvs; underlies Tta, Tpbtd, and Qyatb; units not dated; maximum exposed

Porphyritic biotite trachyandesite—Flows of dark reddish brown devitrified lava containing phenocrysts of large plagioclase, conspicuous biotite, clinopyroxene and sparse olivine in a massive to slightly trachytic groundmass of plagioclase and clinopyroxene. Overlain by QTvs, Tbtd, Tymtb and Qyqtb. Unit is not dated. Maximum observed thickness is ≥160 m.

Porphyritic biotite hornblende trachydacite—Small plug of dark brown, glassy to devitrified lava containing phenocrysts of plagioclase (some sieved), Kspar, hornblende, biotite and minor clinopyroxene and orthopyroxene in trachytic to slightly vesiculated groundmass; microphenocrysts consist of plagioclase and minor clinopyroxene; intrudes Toptb; apparently overlapped by Tbta; unit not dated; maximum exposed thickness about 100 m.

Sugary enclave trachydacite—Composed of two mapable units in SW part of quadrangle west of upper San Mateo Canyon. The basal unit (Tsetdl) consists of brownish gray, porphyritic, glassy lava with 15-20% phenocrysts of plagioclase, pyroxene, hornblende and biotite with angular to rounded enclaves that are most easily seen on weathered surfaces. The basal unit is overlain by light gray porphyritic trachydacite (Tsetdu) having phenocrysts of plagioclase, pyroxene, hornblende, and biotite and angular to subrounded enclaves of reddish gray lava set in a sugary matrix. The contact between the two units is gradational over 1 to 2 m. Plagioclase, minor Kspar, clinopyroxene, hornblende, biotite (the latter three highly oxidized), and opaque oxides are recognized petrographically. Texture is porphyritic, hyalopilitic, and devitrified. Microphenocrysts consist of plagioclase, clinopyroxene, biotite, opaque oxides and noticeable apatite. The enclaves generally have lower phenocryst content than the matrix, consisting of plagioclase, clinopyroxene and biotite. Unit dips steeply to the north. Underlies QTvs, Tpbtd, and Tbtac. Sample of upper flow has 40 Ar/ 39 Ar age of 2.71 ± 0.06 Ma.

Coarse porphyritic trachydacite—Pale pink to tan, very coarse porphyritic lava containing large (≤ 3 cm) phenocrysts of potassium feldspar. Unit superficially looks like granite and makes a distinctive fine gravelly soil. Smaller phenocrysts consist of magnetite, potassium feldspar, plagioclase, oxidized clinopyroxene, and apatite in a hyalopilitic groundmass of tiny felted plagioclase, potassium feldspar, clinopyroxene, opaque oxides and devitrified glass. Unit shows minor Fe-oxide alteration. Unit underlies **Tpetd** in extreme SW corner of quadrangle. Flow from SE corner of quad has 40 Ar/39 Ar age of 2.82 ± 0.04 Ma. Maximum observed thickness

Maximum exposed thickness is about 250 m.

Older plagioclase basaltic trachyandesite — Flows of splotchy white and black porphyritic lavas and containing abundant large (2 cm), often aligned plagioclase phenocrysts. Other phenocrysts consist of clinopyroxene and minor iddingsitized olivine. Groundmass is intersertal and slightly vesicular containing microphenocrysts of plagioclase, iron oxides and devitrified glass. Interbedded in QTvs and Tvst; overlies Trt; underlies Tbta and **Tpbtd**. Flow in lower Salazar Canyon along west central edge of quadrangle has 40 Ar/ 39 Ar date of 2.86 ± 0.04 Ma. Maximum exposed thickness is ≤35 m.

Older megacrystal trachybasalt—Two cone and flow complexes near the east and southeast boundary of the quadrangle that consist of gray to black flows and red to black cinder deposits (Tomtc) of fine-grained trachybasalt; lavas of north complex contain conspicuous large clinopyroxene and olivine phenocrysts, sparse quartz xenocrysts, and rare fragments of Cretaceous sandstone. Eroded cone contains E-trending dike (Tomtd); cone and flow appear to be buried by alluvium and surrounding trachybasalt flows; apparently in fault contact with **Toftb** (described below). Lavas of south complex contain 2-4% phenocrysts of euhedral olivine (≤6 mm), black anhedral clinopyroxene (≤5 mm), minor plagioclase (≤8 mm), and minor quartz xenocrysts (≤12 mm); eroded cone is cut by NE-trending dike and surrounded by younger QTvs. Units are not dated. Maximum observed thickness is <55 m.

Older plagioclase trachybasalt—Two cone and flow complexes of gray flows and red to black cinder deposits (Toftc) consisting of aphyric, fine-grained hawaiite near east and southeast edge of quadrangle; contains trace zoned euhedral plagioclase, tiny interlocking plates of plagioclase and microphenocrysts of olivine and clinopyroxene. Northern cone is highly eroded and contains three dikes (Toftd); cone and flow appear to be buried in alluvium and overlain to the east by Qyxtb. Southern cone contains a NE-trending dike, underlies QTvs and is surrounded from the west by Qyxtb. Units are not dated; maximum observed thickness is ≤100 m.

Older sparsely porphyritic trachybasalt—Black to gray lava flows with sparse plagicalse and olivine phenocrysts exposed along SW edge of quadrangle. Texture is intersertal and slightly vesicular. Groundmass contains plagioclase, augite, minor olivine, opaque oxides, and glass. Olivine shows iddingsite alteration. Source of flows unknown; overlain by QTvs, Tta, and Tbta; intruded by Tbhtd. Unit not dated. Maximum exposed thickness is about 130 m.

Older aphyric trachybasalt—Gray to black flows and red to black cinder deposits (Totc) consisting of aphyric to porphyritic hawaiite. Aphyric specimens contain abundant microphenocrysts of plagioclase and sparse microphenocrysts of olivine and clinopyroxene. Porphyritic flows contain phenocrysts of plagioclase, pyroxene and olivine. Some exposures contain sparse pyroxene clots. The flows form prominent cliffs along south side of San Lucas Valley in NW sector of quadrangle. Eroded cone contains three dikes (Totd). Underlies Tvst, Qypob, **Qyob** and **Qyptb**; overlies **Kmf**. Sample of flow NW of cone has 40 Ar/ 39 Ar age of 3.31 ± 0.08 Ma. Sample of flow in NW part of quad has 40 Ar/ 39 Ar age of 3.20 ± 0.05 Ma. Maximum observed thickness is about 60 m.

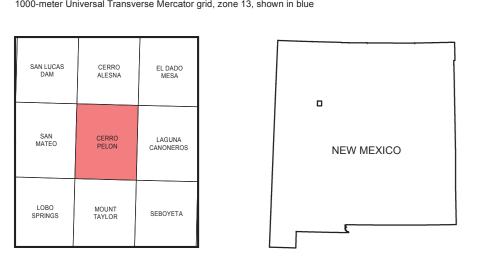
Rhyolite Tuff of Grants Ridge — White to pale pink, bedded pyroclastic fall, flow and surge deposits; some beds have abundant aphyric obsidian clasts. Most lithics consist of pink to gray Precambrian granite and gneiss, chert, sandstone, limestone and rare basanite. Pumice clasts are glassy to slightly devitrified with very rare phenocrysts of potassium feldspar. Tgrt can be difficult to distinguish from lower pyroclastic units in Tvst above because it is thin and similar in appearance on weathered slopes. Underlies Qyxtb and overlies Kmf along FS 456 in NW edge of quadrangle. Obsidian clast in pyroclastic flow from location SW of quadrangle is dated at 3.26 ± 0.04 Ma (Goff et al., 2008). Maximum observed thickness is about 10 m.

Mesa Verde Group

Menefee Formation – Interbedded golden to yellow orange, medium to thin bedded sandstone, black to gray to brown shale and siltstone with carbonized wood fragments, and minor coal. The sandstones are composed of well to moderately sorted, very fine- to fine-grained angular to subrounded quartz and lithic grains (litharenite). The sandstone beds are cross-bedded to tabular-bedded to massive. Cross-beds commonly dip east to northeast. The sandstones are variably weakly cemented and well cemented. White silicified logs and wood fragments are common near 261760E 3914530N (UTM zone 13S, NAD27). Maximum exposed thickness about 45 m.

Kmf

Base map from U.S. Geological Survey 1970, from photographs taken 1965, field checked in 1970, edited in 1993. 927 North American datum, UTM projection -- zone 13N 000-meter Universal Transverse Mercator grid, zone 13, shown in blue



QUADRANGLE LOCATION

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This and other STATEMAP quadrangles are available for free download in both PDF and ArcGIS formats at: http://geoinfo.nmt.edu





Magnetic Declination March 2008 10° 0' East

At Map Center

1 KILOMETER CONTOUR INTERVAL 20 FEET NATIONAL GEODETIC VERTICAL DATUM OF 1929

1:24,000

Open-File Geologic Map 202 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, (L. Greer Price,

Director and State Geologist, Dr. J. Michael Timmons, Geologic Mapping Program Manager).

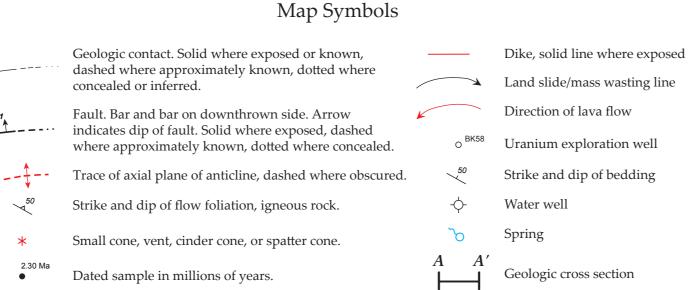
New Mexico Bureau of Geology and Mineral Resources

Geologic map of the Cerro Pelon quadrangle, Cibola and McKinley Counties, New Mexico.

June 2010

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