Geologic Map of New Mexico

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Scale 1:500,000

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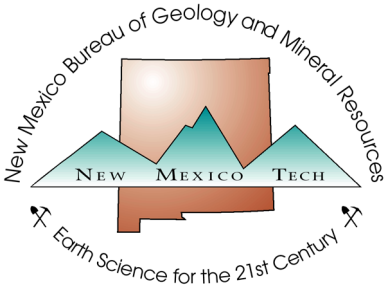

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Executive Summary

This is a data release of the Geologic Map of New Mexico published in 2003. The data was converted from a previous data model to a USGS GeMS Level 3 data model by Kelsey Romero, Amy L. Dunn, and Phil L. Miller. Updates to the geology were also made as needed to correct errors in the original publication. GeMS Level 2 validation was achieved with topology exceptions for the unavoidable "Must Not Have Gaps" error and "Boundary Must Be Covered By" errors for MapUnitPolys that do not have a boundary covered by ContactsAndFaults. This is because MapUnitPolys were built using ContactsAndFaults and dikes that split lithology in MapUnitLines. GeMS Level 3 validation was achieved with topology exceptions in the Correlation of Map Units for "Must Not Have Gaps." "Boundary Must Be Covered By" topology exceptions also exist for polygons built to join to the Description of Map Units headings that do not need to be displayed with the rest of the CMUMapUnitPolys in the Correlation of Map Units. There are also eleven map units missing from the Description of Map Units. These are CMUMapUnitPolys used to build the geologic timescale and are not used as headings in the Description of Map Units.

Description of Map Units

water (Holocene)

playa (Holocene)

SEDIMENTARY

Quaternary

Qa—Alluvium (Holocene to late Pleistocene)—Alluvium

Ql—Landslide deposits and colluvium (Holocene to Pleistocene)—Landslide deposits on western flanks of Socorro Mountains not shown for clarity.

Qpl—Lacustrine and playa deposits (Holocene)—Includes associated alluvial and eolian deposits of major lake basins.

Qp—Piedmont alluvial deposits (Holocene to early Pleistocene)—Includes deposits of higher gradient tributaries bordering major stream valleys, alluvial veneers of the piedmont slope, and alluvial fans. May locally include uppermost Pliocene deposits.

Qe—Eolian deposits (Holocene to middle Pleistocene)—Eolian deposits.

Qeg—Gypsiferous eolian deposits (Holocene to middle Pleistocene)—Gypsiferous eolian deposits.

Qep—Eolian and piedmont deposits (Holocene to middle Pleistocene)—Interlayed eolian sands and piedmont-slope deposits along the eastern flank of the Pecos River valley, primarily between Roswell and Carlsbad. Typically capped by thin eolian deposits.

Qd—Glacial deposits; till and outwash (late to middle Pleistocene)—Glacial deposits; till and outwash.

Qoa—Older alluvial deposits of upland plains and piedmont areas, and calcic soils and eolian cover sediments of High Plains region (middle to early Pleistocene)—Includes scattered lacustrine, playa, and alluvial deposits of the Tahoka, Double Tanks,

Tule, Blackwater Draw, and Gatuña Formations, the latter of which may be Pliocene at base; outcrops, however, are basically of Quaternary deposits.

Quaternary and Tertiary

QTt—Travertine (Holocene to Pliocene)—Includes some pedogenic carbonate south of Sierra Ladrones.

QTp—Older piedmont alluvial deposits and shallow basin fill (middle Pleistocene to latest Pliocene)—Includes Quemado Formation and in northeast, high-level pediment gravels.

QTs—Upper Santa Fe Group (middle Pleistocene to latest Miocene)—Includes Camp Rice, Fort Hancock, Palomas, Sierra Ladrones, Arroyo Ojito, Ancha, Puye, and Alamosa Formations.

QTsf—Santa Fe Group, undivided (middle Pleistocene to latest Oligocene)—Basin fill of the Rio Grande rift. Locally represents upper Miocene formations of the middle Santa Fe Group in the northern Albuquerque Basin.

QTg—Gila Group, Formation, or Conglomerate (middle Pleistocene to latest Oligocene?)—Includes Mimbres Formation and several informal units in southwestern basins.

Tertiary

Tus—Upper Tertiary sedimentary units (Pliocene to late Oligocene)—Includes Bidahochi Formation (Pliocene to late Miocene), Picuris Formation, (Miocene to Oligocene), Las Feveras Formation (Pliocene), lower Gila Group units in the southwest, and unnamed Pliocene unit in northwestern Socorro County.

To—Ogallala Formation (early Pliocene to middle Miocene)—Alluvial and eolian deposits, and petrocalcic soils of the southern High Plains. Locally includes Qoa.

Tfl—Fence Lake Formation (Miocene)—Conglomerate and conglomeratic sandstone, coarse fluvial volcaniclastic sediments, minor eolian facies, and pedogenic carbonates of the southern Colorado Plateau region.

Tsf—Lower Santa Fe Group (late Miocene to latest Oligocene)—Includes Hayner Ranch, Rincon Valley, Popotosa, Cochiti, Tesuque, Chamita, Abiquiu, Zia, and other formations.

Tlp—Los Pinos Formation of lower Santa Fe Group (Miocene and late Oligocene)—Includes Carson Conglomerate (Dane and Bachman, 1965) in Tusas Mountains–San Luis Basin area.

Tc—Chuska Sandstone (middle to late Oligocene)—Restricted to Chuska Mountains.

Tps—Paleogene sedimentary units (Paleogene)—Includes Baca, Galisteo, El Rito, Blanco Basin, Hart Mine, Love Ranch, Lobo, Sanders Canyon, Skunk Ranch, Timberlake, and Cub Mountain Formations.

Tsj—San Jose Formation (Eocene)—San Juan Basin.

Tn—Nacimiento Formation (Paleocene)—San Juan Basin.

Toa—Ojo Alamo Formation (Paleocene)—San Juan Basin.

Tertiary and Cretaceous

TKpc—Poison Canyon Formation (Paleocene and Late Cretaceous)—Proximal conglomerates and sandstones in western Raton Basin; generally lacking coal beds. Cretaceous beds mostly restricted to subsurface.

TKr—Raton Formation (Paleocene and Late Cretaceous)—Distal sandstones, mudstones, and coal beds in eastern Raton Basin. Middle barren zone laterally equivalent to Poison Canyon Formation. K/T boundary discontinuously exposed about 100 m above basal conglomerate in area southwest of Raton.

TKpr—Poison Canyon and Raton Formations (Paleocene and Late Cretaceous)—Broadly intertonguing conglomeratic sandstones, sandstones and mudstones; minor coal beds.

IGNEOUS

Quaternary

Qb—Basaltic to andesitic lava flows (Holocene to middle Pleistocene)—Flows south of Grants and west of Carrizozo are Holocene. Includes minor vent deposits.

Qv—Basaltic tephra and lavas near vents (late to middle Pleistocene)—Tuff rings, maars, cinder cones, and minor proximal lavas. Includes maars at Kilbourne Hole and Zuni Salt Lake.

Qbo—Basaltic to andesitic lava flows (middle to early Pleistocene)—Includes vent deposits.

Qvr—Ring-fracture rhyolite lava domes of the Valles caldera (latest to early Pleistocene)—Upper members of the Valles Rhyolite in Jemez Mountains. Includes 60-ka Banco Bonito and El Cajete Members on south margin of caldera.

Qr—Older rhyolite lavas and early volcaniclastic sedimentary fill deposits of the Valles caldera (early Pleistocene)—Units are associated with resurgent doming or predate doming of the caldera core. Includes minor middle Pleistocene tuffs of the upper Valles Rhyolite on north side of caldera.

Qbt—Bandelier Tuff (early Pleistocene)—Includes large blocks of older andesite in caldera-collapse breccia facies locally exposed on resurgent dome of the Valles caldera.

Quaternary and Tertiary

QTb—Basaltic to andesitic lava flows (late Pleistocene to early Pliocene)—Includes minor vent deposits.

Tertiary

Tpb—Basaltic to andesitic lava flows (Pliocene)—Includes minor vent deposits and small shield volcanoes. Flows are commonly interbedded in the Santa Fe and Gila Groups.

Tmb—Basaltic to andesitic lava flows (Miocene)—Includes minor vent deposits. Flows are commonly interbedded in the Santa Fe and Gila Groups.

Tnb—Basaltic to andesitic lava flows (Neogene)—Includes minor vent deposits. Flows are commonly interbedded in the Santa Fe and Gila Groups.

Tnr—Silicic to intermediate volcanic rocks (Neogene, mostly Miocene)—Rhyolite and dacite flows with associated minor tuffs. Commonly interbedded with Santa Fe or Gila Group sedimentary units. Dacitic lavas in northern Jemez Mountains are Pliocene.

Tnv—Intermediate to silicic volcanic rocks (Neogene)—Mostly andesitic to dacitic stratovolcanoes. Includes rhyolite lavas and tuffs in the Jemez Mountains. Volcanoes in Jemez Mountains and eastern Colfax County are late Miocene. Mount Taylor and composite volcanoes in the Taos Plateau volcanic field are Pliocene.

Thb—Hinsdale Basalt (Miocene and late Oligocene)—Northern Taos and eastern Rio Arriba Counties; basalt flows interbedded with Los Pinos Formation.

Tuau—Upper middle Tertiary basaltic andesites and andesites of the Mogollon Group (early Miocene and latest Oligocene, 22–26 Ma)—Includes Bearwallow Mountain Andesite and basaltic andesite of Mangas Mountain; also near-vent basaltic lavas and shallow intrusions in the Chuska Mountains.

Tual—Lower-upper middle Tertiary basaltic andesites and andesites of the Mogollon Group (late Oligocene, 26–29 Ma)—Includes La Jara Peak Basaltic Andesite, Uvas Basaltic Andesite, basaltic andesites of Poverty Creek and Twin Peaks, Squirrel Springs Canyon Andesite, Razorback Basalt, Bear Springs Basalt, flows of Gila Flat, Salt Creek Formation, Middle Mountain Formation, and the Alum Mountain Group. Pre-Amalia-Tuff lavas in the Questa caldera are dominantly silicic andesites and dacites; elsewhere silicic lavas are a minor component of Tual.

Tvs—Middle Tertiary volcaniclastic sedimentary units (Oligocene to late Eocene)—Mostly syneruptive volcaniclastic sedimentary aprons. Lower units dominantly derived from volcanic highlands of andesitic to dacitic composition. Locally includes minor lavas and tuffs. Younger units (above and intertongued with Mogollon Group tuffs, Turp) include upper Bell Top Formation, South Crosby Peak Formation, and upper

Spears Group units near Quemado. Older units (below and intertongued with Datil Group tuffs, Tlrp) include Palm Park, lower Bell Top, Espinaso and Pueblo Creek Formations and lower Spears Group formations such as Rincon Windmill, Chavez Canyon, and Dog Springs.

Turf—Upper middle Tertiary rhyolitic lavas and local tuffs (late Oligocene, 24–29 Ma)—Includes Taylor Creek Rhyolite, Fanney Rhyolite, rhyolite of Rocky Canyon, rhyolite of Hardy Ridge, and upper rhyolite members of the Luis Lopez and Sawmill Canyon formations.

Tlrf—Lower middle Tertiary rhyolitic lavas and local tuffs (early Oligocene to late Eocene, 31–36 Ma)—Includes Mimbres Peak Formation, rhyolite of Cedar Hills, and other units in the Bootheel region.

Turp—Upper middle Tertiary rhyolitic pyroclastic rocks of the Mogollon Group, ash-flow tuffs (late Oligocene, 24–30 Ma)—Regional ash-flow tuffs include the La Jencia, Vicks Peak, Lemitar, South Canyon, Bloodgood Canyon, Shelly Peak, Davis Canyon, Park, Rhyolite Canyon, Apache Spring, and AmaliaTuffs; the tuffs of Horseshoe Canyon, Diamond Creek, Garcia Camp, Caronita Canyon, Turkey Springs, and Little Mineral Creek; and the Jordan Canyon Formation. Includes some locally erupted lavas and tuffs within thick intra caldera units; includes minor volcaniclastic sedimentary units between thin outflow sheets.

Tlrp—Lower middle Tertiary rhyolitic to dacitic pyroclastic rocks of the Datil Group, ash-flow tuffs (early Oligocene to late Eocene, 31–36 Ma)—Regional ash-flow tuffs include Hells Mesa, Kneeling Nun, Caballo Blanco, Datil Well, Lebya Well, Rock House Canyon, Blue Canyon, Sugarlump, Oak Creek, Bluff Creek, Gillespie, Box Canyon, Cooney, and Chiquito Peak Tuffs; the tuffs of Steins Mountain, Black Bill Canyon, Woodhaul Canyon, and Farr Ranch; tuffs of the Organ cauldron; and lower tuffs in the Bell Top Formation. Includes some locally erupted lavas and tuffs within thick

intracaldera units; includes minor volcaniclastic sedimentary units and lavas between thin outflow sheets.

Tla—Lower middle Tertiary andesitic to dacitic lavas and pyroclastic flow breccias (late to middle Eocene, 33–43 Ma)—Includes Rubio Peak Formation, Orejon Andesite, andesite of Dry Leggett Canyon, andesite of Telephone Canyon, and other units in southwestern, central, and northern New Mexico. Locally includes minor mafic lavas. Ancient landslide blocks of Madera Limestone, as much as one mile long, occur within Rubio Peak lavas in the central Black Range, west of Winston.

Tuv—Upper middle Tertiary volcanic rocks (early Miocene to late Oligocene, younger than 30 Ma)—Mostly a combination of basaltic andesite lavas and rhyolitic ash-flow tuffs of the Mogollon Group (Tuau + Tual + Turp). Includes locally erupted lavas and tuffs in some calderas.

Tlv—Lower middle Tertiary volcanic rocks (early Oligocene to late Eocene, older than 31 Ma)—Mostly intermediate lavas of the lower Datil Group and intermediate volcaniclastic sediments of the lower Spears Group (Tla + Tvs). Locally includes ash-flow tuffs of the upper Datil Group (Tlrp). Includes intermediate volcaniclastic sedimentary rocks of the Conejos Formation in northern New Mexico.

Tv—Middle Tertiary volcanic rocks, undifferentiated (early Miocene to late Eocene)—Includes the predominantly andesitic to dacitic stratovolcano complex at Sierra Blanca (Oligocene to late Eocene) and many smaller outliers.

Ti—Tertiary intrusive rocks of intermediate to silicic composition (Pliocene to Eocene)—Includes monzonitic to granitic plutons, stocks, laccoliths, and porphyritic dikes in deeply eroded magmatic centers; and andesitic, dacitic, or rhyolitic plugs and dikes near cauldrons or stratovolcanoes. In the Latir field, fine-grained rhyolitic dikes commonly cut coarse-grained granitic plutons. Includes alkaline laccoliths, plugs, and dikes in Colfax County. North-trending dikes near Capitan include some mafic diabase dikes.

Tim—Tertiary mafic intrusive rocks (Pliocene to late Eocene)—Includes many long basaltic andesite dikes of Oligocene age near Pie Town, Acoma, Riley, Chupadera, Truth or Consequences, Roswell, Raton, and Dulce; and several elongate or shoestring-like sills of basalt or basaltic andesite. Also includes basaltic necks of Pliocene age that dot the landscape northeast of Mount Taylor. Where dikes extend into Quaternary alluvium the contact is an unconformity.

Tertiary and Cretaceous

TKa—Animas Formation (Paleocene and Late Cretaceous)—Volcaniclastic sedimentary rocks of intermediate composition in northern San Juan Basin.

TKav—Tertiary–Cretaceous andesitic to dacitic lavas and pyroclastic breccias (Paleocene and Late Cretaceous)—Includes many remnants of eruptive centers in Grant and Hidalgo Counties and Upper Cretaceous andesitic lavas in Sierra County.

TKi—Tertiary–Cretaceous intrusive rocks (Paleocene and Late Cretaceous)—Includes granodiorite to quartz monzonite stocks and plutons at Hanover, Fierro, Tyrone, Lordsburg, and the 73-Ma quartz monzonite porphyry stock at Copper Flats in Sierra County. Also includes many northeast-trending monzonite porphyry dikes in the Silver City region.

CRETACEOUS

K—Cretaceous rocks, undivided (Cretaceous)—Cretaceous rocks, undivided.

Ku—Upper Cretaceous rocks of southwestern New Mexico, undivided (Maastrichtian to Cenomanian for the most part, although Beartooth and Sarten Formations are in part Albian)—Includes Virden Formation in northern Hidalgo County, Ringbone Formation in Hidalgo, Luna, and Grant Counties, Beartooth and Sarten Formations in Luna and Grant Counties, Mancos Shale in Silver City area.

Kmc—McRae Formation (Maastrichtian)—Engle Basin–Cutter sag area.

Kvt—Vermejo Formation and Trinidad Sandstone (Maastrichtian to Campanian)—Vermejo Formation and Trinidad Sandstone.

Kkf—Kirtland and Fruitland Formations (Campanian)—Coal-bearing, primarily in the Fruitland.

Kpc—Pictured Cliffs Sandstone (Campanian)—Prominent, cliff-forming marine sandstone.

Kls—Lewis Shale (Campanian)—Marine shale and mudstone.

Kpn—Pierre Shale and Niobrara Formation (Campanian to Coniacian)—Pierre Shale and Niobrara Formation.

Knf—Fort Hays Limestone Member of Niobrara Formation (Coniacian to Turonian)—Fort Hays Limestone Member of Niobrara Formation.

Kmv—Mesaverde Group (Campanian to Turonian)—Includes Cliff House Sandstone, Menefee Formation and Point Lookout Sandstone.

Kch—Cliff House Sandstone (Campanian)—Transgressive marine sandstone.

Klv—La Ventana Tongue of the Cliff House Sandstone (Turonian)—La Ventana Tongue of the Cliff House Sandstone (Turonian).

Kmf—Menefee Formation (Campanian to Santonian)—Mudstone, shale, and sandstone; coal-bearing.

Kpl—Point Lookout Sandstone (Campanian to Santonian)—Regressive marine sandstone in McKinley and Sandoval Counties; the lower, Hosta Tongue, of Point Lookout is transgressive and is separated from main body by the Satan Tongue of Mancos Shale.

Kms—Satan Tongue of Mancos Shale (Santonian)—Satan Tongue of Mancos Shale.

Kph—Hosta Tongue of Point Lookout Sandstone (Santonian)—Transgressive Sandstone.

Kmm—Mulatto Tongue of Mancos Shale (Santonian to Coniacian)—Mulatto Tongue of Mancos Shale.

Kcc—Crevasse Canyon Formation (Santonian to Coniacian)—Coal-bearing units are Dilco and Gibson Coal Members; other members are Bartlett Barren, Dalton Sandstone, and Borrego Pass Sandstone (or Lentil).

Kg—Gallup Sandstone (Turonian)—Generally regressive marine sandstone.

Kgm—Gallup Sandstone and underlying D-Cross Tongue of the Mancos Shale (Turonian)—Gallup Sandstone and underlying D-Cross Tongue of the Mancos Shale.

Kmr—Rio Salado Tongue of the Mancos Shale (Turonian)—Overlies Twowells Tongue of Dakota Sandstone; mapped only where Tres Hermanos Formation or the Atarque Sandstone is present; mapped as Kdr in parts of Socorro County.

Kpg—Pescado Tongue of the Mancos Shale and Gallup Sandstone (Turonian)—In Zuni Basin only; Pescado is chronostratigraphic equivalent of Juana Lopez Member of Mancos Shale.

Kth—Tres Hermanos Formation (Turonian)—Formerly designated as lower Gallup Sandstone in the Zuni Basin.

Kma—Moreno Hill Formation and Atarque Sandstone (Turonian)—In Salt Lake coal field and extreme southern Zuni Basin.

Km—Mancos Shale (Cenomanian to Campanian)—Divided into upper and lower parts by Gallup Sandstone.

Kmu—Mancos Shale, upper part (Campanian to Coniacian)—Mancos Shale, upper part.

Kml—Mancos Shale, lower part (Turonian and Cenomanian)—Mancos Shale, lower part.

Kdr—Dakota Sandstone (Cenomanian) and Rio Salado Tongue of the Mancos Shale (Cenomanian)—In northwest Socorro County locally includes overlying Tres Hermanos Formation.

Kgc—Greenhorn Formation and Carlile Shale, undivided (Turonian to Cenomanian)—Locally includes Graneros Shale.

Kc—**Carlile Shale (Turonian)**—Limited to northeastern area.

Kgg—**Greenhorn Formation and Graneros Shale (Turonian to Cenomanian)**—Limited to northeastern area.

Kgh—**Greenhorn Formation (Turonian to Cenomanian)**—Limited to northeastern area; the upper member (Bridge Creek Limestone Member) can be traced into western area where it is commonly shown as a bed-rank unit in Mancos Shale on detailed maps.

Kgr—**Graneros Shale (Cenomanian)**—Limited to northeastern area.

Kmd—**Intertongued Mancos Shale and Dakota Sandstone of west-central New Mexico (Cenomanian)**—Includes the Whitewater Arroyo Tongue of Mancos Shale and the Twowells Tongue of the Dakota.

Kd—**Dakota Sandstone (Cenomanian)**—Includes Oak Canyon, Cubero, and Paguate Tongues; includes Clay Mesa Tongue of Mancos Shale.

Kdg—**Upper and Lower Cretaceous rocks of east-central and northeast New Mexico (Cretaceous)**—Consists of Dakota Group, which includes Romeroville Sandstone (Cenomanian), Pajarito Shale, and Mesa Rica Sandstone (Albian); the underlying Tucumcari Shale (Albian) in Tucumcari area; and Glencairn Formation (Albian) in Union County.

Kmb—**Mancos Shale (Cenomanian) and Beartooth and Sarten Formations (Albian) (Cenomanian and Albian)**—Mancos includes what was formerly referred to as Colorado Shale, which in turn may include equivalents of Tres Hermanos Formation.

Kl—**Lower Cretaceous, undivided (Early Cretaceous)**—In northern Lea and Roosevelt Counties includes equivalents of Tucumcari Shale; in Cornudas Mountains includes Campagrande and Cox Formations and Washita Group; at Cerro de Cristo Rey includes several formations of the Fredericksburg and Washita Groups, and the Boquillas Formation (Cenomanian); in the southwest, includes Mojado, U-Bar (Aptian), and Hell-to-Finish Formations, which are equivalent to Bisbee Group of Arizona.

JURASSIC

J—Upper and Middle Jurassic rocks, undivided (Late and Middle Jurassic)—In southwest includes the basalt-bearing Broken Jug Formation.

Jm—Morrison Formation (Late Jurassic)—Upper Jurassic nonmarine rocks.

Jmsu—Morrison Formation and upper San Rafael Group (Earliest Cretaceous? to Late Jurassic)—Morrison Formation and upper San Rafael Group.

Jz—Zuni Sandstone (Callovian)—Consists of undivided equivalents of the Summerville Formation and Bluff Sandstone; restricted to Zuni Basin area.

Jze—Zuni and Entrada Sandstones, undivided (Middle Jurassic)—Zuni and Entrada Sandstones, undivided.

Je—Entrada Sandstone (Middle Jurassic)—Entrada Sandstone.

Jsr—San Rafael Group (Middle Jurassic)—Consists of Entrada Sandstone, Todilto and Summerville Formations, Bluff Sandstone, and locally Zuni Sandstone (or only Acoma Tongue of Zuni).

TRIASSIC

Ŧr—Triassic rocks, undivided (Triassic)—Continental red beds.

Ŧrp—Rock Point Formation of Chinle Group (Late Triassic)—May locally include Wingate Sandstone (Triassic).

Ŧrc—Chinle Group (Late to Middle Triassic)—Map unit includes Moenkopi Formation (Middle Triassic) at base in many areas; in eastern part of state the following five formations are mapped.

Ŧrr—Redonda Formation (Late Triassic)—Redonda Formation.

Ŧrb—Bull Canyon Formation (Norian)—Bull Canyon Formation.

Ŧrt—Trujillo Formation (Norian)—Trujillo Formation.

Ŧrg—Garita Creek Formation (Carnian)—Garita Creek Formation.

Ŧrs—Santa Rosa Formation (Carnian)—Includes Moenkopi Formation (Middle Triassic) at base in most areas.

Trcu—Upper Chinle Group, Garita Creek through Redonda Formations, undivided (Late Triassic)—Upper Chinle Group, Garita Creek through Redonda Formations, undivided.

Trm—Moenkopi Formation (Middle Triassic)—Moenkopi Formation.

PALEOZOIC

Pz—Paleozoic rocks, undivided (Paleozoic)—Paleozoic rocks, undivided.

P—Permian rocks, undivided (Permian)—Permian rocks, undivided.

Pqm—Quartermaster Formation (late Permian)—Red sandstone and siltstone.

Pqr—Quartermaster and Rustler Formations (late Permian)—Quartermaster and Rustler Formations.

Pr—Rustler Formation (late Permian)—Siltstone, gypsum, sandstone, and dolomite.

Psl—Salado Formation (late Permian)—Evaporite sequence, dominantly halite.

Pc—Castile Formation (late Permian)—Dominantly anhydrite sequence.

Pat—Artesia Group (Guadalupian)—Shelf facies forming broad south-southeast trending outcrop from Glorieta to Artesia area; includes Tansill, Yates, Seven Rivers, Queen and Grayburg Formations (Guadalupian). May locally include Moenkopi Formation (Triassic) at top.

Pty—Tansill and Yates Formations (Guadalupian)—Sandstone, siltstone, limestone, dolomite, and anhydrite.

Psr—Seven Rivers Formation (Guadalupian)—Gypsum, anhydrite, salt, dolomite, and siltstone.

Pqg—Queen and Grayburg Formations (Guadalupian)—Sandstone, gypsum, anhydrite, dolomite, and red mudstone.

Pcp—Capitan Formation (Guadalupian)—Limestone (reef facies).

Pbc—Bell Canyon Formation (Guadalupian)—Basin facies—sandstone, limestone, and shale.

Pcc—Cherry Canyon Formation (Guadalupian)—Basin facies—sandstone, limestone, and shale.

Psa—San Andres Formation (Guadalupian in south, in part Leonardian to north)—Limestone and dolomite with minor shale.

Pg—Glorieta Sandstone (Leonardian)—Texturally and mineralogically mature, high-silica quartz sandstone.

Psg—San Andres Limestone and Glorieta Sandstone (Guadalupian and Leonardian)—San Andres Limestone and Glorieta Sandstone.

Pco—Cutoff Shale (Leonardian)—In Brokeoff Mountains only.

Pvp—Victorio Peak Limestone (Leonardian)—In Brokeoff Mountains only.

Py—Yeso Formation (Leonardian)—Sandstones, siltstones, anhydrite, gypsum, halite, and dolomite.

Pa—Abo Formation (Wolfcampian)—Red beds, arkosic at base, finer and more mature above; may include limestone beds of Pennsylvanian age (Virgilian) in Zuni Mountains; in Robledo Mountains the Abo may be considered a member of the Hueco Formation.

Pau—Upper part of Abo Formation (Wolfcampian)—Upper part of Abo Formation.

Pal—Lower part of Abo Formation (locally Virgilian to Late Pennsylvanian)—Lower part of Abo Formation.

Psy—San Andres, Glorieta, and Yeso Formations, undivided (Guadalupian and Leonardian)—San Andres, Glorieta, and Yeso Formations, undivided.

Pya—Yeso and Abo Formations, undivided (early Permian)—Yeso and Abo Formations, undivided.

Pct—Cutler Formation (Wolfcampian to Late Pennsylvanian)—Used in northern areas and Chama embayment only.

Ph—Hueco Formation or Group (Wolfcampian)—Limestone unit restricted to south-central area. Pendejo Tongue of Hueco Formation divides Abo Formation into upper and lower parts in Sacramento Mountains.

Pb—Bursum Formation (earliest Permian to latest Pennsylvanian)—Shale, arkose, and limestone.

PIP—Permian and Pennsylvanian rocks, undivided (Permian and Pennsylvanian)—Includes Concha, Scherrer, Colina, Epitaph, and Earp Formations (Permian) and Horquilla Limestone.

PIPsc—Sangre de Cristo Formation (Wolfcampian to Desmoinesian)—In Sangre de Cristo Mountains.

IP—Pennsylvanian rocks, undivided (Pennsylvanian)—In Sangre de Cristo Mountains may include Sandia, Madera, La Pasada, Alamitos, and Flechado Formations; elsewhere may include Bar-B, Nakaye, Red House, Oswaldo, and Syrena Formations.

IPm—Madera Group (Pennsylvanian)—In Manzano Mountains includes Wild Cow Formation and Los Moyos Limestone; in Lucero Mesa includes Red Tanks, Atrasado, Gray Mesa Formations; in Sacramento Mountains includes the non-Madera Holder, Beeman, and Gobbler Formations. May include strata lumped as Magdalena Group in a few areas.

IPs—Sandia Formation (Atokan)—Predominantly clastic unit (commonly arkosic) with minor black shales, and limestone in lower part; map unit locally includes Morrowan Osha Canyon Formation in Sierra Nacimiento.

IPps—Panther Seep Formation (Virgilian)—In Organ, Franklin, and San Andres Mountains.

IPlc—Lead Camp Formation (Atokan to Missourian)—In San Andres and Organ Mountains.

M—Mississippian rocks, undivided (Mississippian)—Arroyo Peñasco Group in Sangre de Cristo Mountains, Sierra Nacimiento, San Pedro Mountains, and Sandia Mountains; Lake Valley Limestone in south-central New Mexico.

MD—Mississippian and Devonian rocks, undivided (Mississippian and Devonian)—Includes Helms, Rancheria, Las Cruces, Lake Valley, and Caballero Formations and

Escabrosa Group (Mississippian); Percha Shale, Contadero, Sly Gap, and Oñate Formations of south-central New Mexico, and Canutillo Formation of northern Franklin Mountains and Bishops Cap area (Devonian).

M€—Mississippian through Cambrian rocks, undivided (Mississippian to Cambrian)—Includes Lake Valley Limestone (Mississippian); Devonian rocks, undivided; El Paso Formation and Montoya Group or Formation (Ordovician); and Bliss Sandstone (Ordovician and Cambrian).

D—Devonian rocks undivided (Devonian)—Includes Percha Shale, Oñate, and Sly Gap Formations.

SO—Silurian and Ordovician rocks, undivided (Silurian and Ordovician)—Silurian and Ordovician rocks, undivided.

SO€—Silurian through Cambrian rocks, undivided (Silurian to Cambrian)—Silurian through Cambrian rocks, undivided.

O€—Ordovician and Cambrian rocks, undivided (Ordovician and Cambrian)—Includes Montoya Formation (or Group), El Paso Formation, and Bliss Sandstone.

O€p—Ordovician and Cambrian plutonic rocks of Florida Mountains (Ordovician and Cambrian)—Ordovician and Cambrian plutonic rocks of Florida Mountains.

PROTEROZOIC

Supracrustal

Ys—Mesoproterozoic sedimentary rocks (Mesoproterozoic)—Exposed in Sacramento Mountains, present in subsurface in southeastern New Mexico as De Baca Group.

Xps—Paleoproterozoic pelitic schist (Paleoproterozoic)—Includes Rinconada Formation in northern New Mexico and Blue Springs Schist in Manzano Mountains.

Xq—Paleoproterozoic quartzite (Paleoproterozoic)—Includes ≈1.70 Ga Ortega Quartzite and equivalents in northern New Mexico and ≈1.67 Ga quartzites in central New Mexico.

Xs—Paleoproterozoic metasedimentary rocks (Paleoproterozoic)—Pelitic schist, quartz-muscovite schist, immature quartzite, and subordinate amphibolite; includes parts of Vadito Group in northern New Mexico, immature metasedimentary rocks of central New Mexico, and Bullard Peak Series mixed supracrustal rocks in Burro Mountains.

Xvf—Paleoproterozoic rhyolite and felsic volcanic schist (Paleoproterozoic)—Includes 1.70 Ga Vadito Group in northern New Mexico and ≈1.68 Ga Sevilleta Metarhyolite in central New Mexico.

Xvm—Paleoproterozoic mafic metavolcanic rocks with subordinate felsic metavolcanic rocks (Paleoproterozoic)—Includes the 1.72–1.78 Ga Moppin (Tusas Mountains), Gold Hill (Taos Range), and Pecos (Sangre de Cristo Mountains) complexes; interpreted to be supracrustal part of juvenile volcanic arc basement.

Intrusive

Zi—Neoproterozoic mafic dikes (Neoproterozoic)—Exposed in Taos Range.

Yi—Mesoproterozoic mafic dikes, diabase, metadiabase, metadiorite (Mesoproterozoic)—Mainly in Burro Mountains; age not well constrained.

Yg—Mesoproterozoic granitic plutonic rocks (Mesoproterozoic)—Mainly 1.35–1.45 Ga megacrystic granites, generally weakly foliated except locally at their margins.

YXp—Mesoproterozoic and Paleoproterozoic plutonic rocks, undivided (Mesoproterozoic and Paleoproterozoic)—Plutonic rocks, undivided.

Xg—Paleoproterozoic granitic plutonic rocks (Paleoproterozoic)—Variably foliated granites and granitic gneisses; 1.65–1.71 Ga in northern New Mexico; 1.65–1.66 Ga in central and southern New Mexico.

Xpc—Paleoproterozoic calc-alkaline plutonic rocks (Paleoproterozoic)—Granodiorite, diorite, and gabbro complexes; 1.71–1.78 Ga; interpreted to be intrusive part of juvenile volcanic arc basement.