

APPENDIX A: EXPLANATION OF GEOLOGIC UNITS

West San Antonio Region

Bandera, Castroville, Comanche Waterhole, D'Hanis, Flatrock Crossing,
Hondo, Murphy School, Mustang Valley, Quihi, Riomedina, Sabinal,
Sabinal NE, Seco Pass, Tarpley, Tarpley Pass, Texas Mountain,
Timber Creek, and Twin Hollow Quadrangles, Texas

(1:24,000 scale)

QUATERNARY

Qal—Alluvium. Unconsolidated gravel, sand, silt, and clay along streams and rivers; inundated regularly. Gravel is mostly limestone and chert. Along minor drainages includes undivided low terrace deposits. Includes some local bedrock outcrops that are undivided.

Qt—Terrace deposits. Unconsolidated gravel, sand, silt, and clay along streams and rivers. Mostly above flood level. Deposits of adjacent terraces at different elevations are mapped separately.

Ql—Landslide deposits. Local deposits of Little Creek canyon area within Seco Pass Quadrangle.

Qle—Leona Formation. Fine calcareous silt grading down into coarse gravel.

Qt+Qle—Terrace deposits and Leona Formation, undivided

TERTIARY

QTu—Uvalde gravel (older alluvium). Gravel and sand, some clay; well-rounded pebble- to cobble-sized gravel common, few boulders; mostly chert and limestone, commonly cemented by caliche. Deposits typically cap topographically high areas. Precise age unknown; approximately upper Tertiary to Quaternary. Thickness ranges from several feet of gravel lag to more than 10 ft.

Eocene to Paleocene

PAEw+PAm—Wilcox (Paleocene to Eocene) and Midway (Paleocene) Groups, undivided. Outcrops are not common. Wilcox Group is sandstone and mudstone; some shale and lignite. Thickness ranges between 440 and 700 ft. Midway Group is mudstone, silt/siltstone, sand/sandstone, and sandy fossiliferous limestone. Thickness as much as ~75 ft.

TERTIARY TO UPPER CRETACEOUS

PAm+Kes—Midway Group (Paleocene) and Escondido (Upper Cretaceous) Formation, undivided. Midway Group is mudstone, silt/siltstone, sand/sandstone, and sandy fossiliferous limestone. Outcrops are not common. Thickness as much as ~75 ft. Escondido Formation is mudstone, siltstone, sandstone, and silty limestone. Includes thin (as much as ~30 ft), lower marl and mudstone unit, Corsicana marl. Outcrops are not common. Escondido thickness ranges between 550 and 900 ft.

CRETACEOUS

Upper Cretaceous

Ki—Intrusive igneous rocks. Basalt (field term). Generally not well exposed. Locations from Welder and Reeves (1964). Some very small outcrops noted by Holt (1959) in Medina County are not shown.

Kes—Escondido Formation. Mudstone, siltstone, sandstone, and silty limestone. Includes thin (as much as ~30 ft), lower marl and mudstone unit, Corsicana marl. Outcrops are not common. Escondido thickness ranges between 550 and 900 ft.

Kan—Anacacho Formation. Limestone and marl. Grain-rich limestone common. Light gray to white, thin to thick bedded, glauconitic, and contains fossil fragments. Thickness ranges from 240 to 500 ft.

Kan+QTu—Undivided Cretaceous Anacacho Formation and Quaternary to Tertiary Uvalde gravel.

Kau—Austin Group. Chalk, marl, and limestone. Light gray to white, thin to thick bedded, massive to slightly nodular. Chalk mostly microgranular calcite with minor foraminifera tests; abundant *Inoceramus* prisms. Chalk forms ledges and alternates with marl and locally bentonitic seams. Sparsely glauconitic pyrite nodules partly weathered to limonite are common. Thick caliche on most outcrops. Thick black soil with juniper and live oak in low-relief areas. Locally highly fossiliferous with pelecypods, echinoids, ostracodes, and forams. Thickness 135 to 200 ft.

Kef—Eagle Ford Formation. Shale, siltstone, and limestone. Upper part limestone and shale. Shale dark gray. Limestone light yellowish brown, flaggy, in beds as much as 4 ft thick. Lower part siltstone and very fine grained sandstone, light yellow to gray, laminated, flaggy, some limestone, silty, medium brown, laminated. Flat to gently rolling topography. Covered with dark-brown soil on slopes; outcrops are rare. Strata at slope break of Eagle Ford/Buda contact commonly fossiliferous with oysters, ostracodes, forams, fish bones, teeth, and *Inoceramus*. Thickness 15 to 30 ft.

Kbu—Buda Limestone. Limestone. Hard and dense to chalky, poorly bedded to nodular, glauconitic, fossiliferous, abundant broken shell fragments locally. Light gray to pale orange; weathers dark gray to brown. Thinner bedded and argillaceous near upper contact. Lower part is soft, chalky limestone. Upper contact is disconformable, sharp, and conspicuous. Forms resistant cap on hills. Weathers to form thin, red-brown soil with rounded cobbles of limestone. Less glauconitic and less iron-oxide-stained than Georgetown Formation. More fossil gastropods than Austin Group. Burrows filled with chalky marl. Abundant pelecypods, forams, ostracodes, serpulids, echinoid spines, and bryozoans. Locally, solitary corals and green algae. Thickness 40 to 65 ft.

Kdr—Del Rio Formation. Clay. Gypsiferous, calcareous, pyrite common, poorly indurated, plastic, dark gray to olive brown; abundant *Ilymatogyra arietina* (formerly *Exogyra arietina*). Becomes less calcareous and more gypsiferous upward; blocky, medium gray, weathers light gray

to yellowish gray. Some thin lenticular beds of highly calcareous siltstone. Slope forming or underhanging where slumped below overlying Buda. Forms highly expansive soil. Water tanks for livestock commonly excavated on outcrops. Upper and lower contacts gradational. Marine megafossils include abundant *Ilymatogyra arietina* (formerly *Exogyra arietina*) and other pelecypods. Thickness 15 to 50 ft.

Lower Cretaceous

Kgt—Georgetown Formation. Limestone and some marl. Nodular to bedded, gray to tan; abundant fossils include *Waconell wacoensis* (formerly *Kingena wacoensis*) and *Gryphaea washitaensis*. Few interbeds of marl 2 to 3 inches thick. Upper contact is conformable and gradational where exposed, commonly obscured by slumping of the overlying Del Rio Formation. Lower contact is disconformable. Diverse assemblage of fossils includes ammonoids, forams, echinoids, and pelecypods. Unit poorly exposed and mostly inferred on maps; locally may be absent. As much as 30 ft thick.

Kp—Person Formation. The Person Formation is the upper unit of the Edwards Group in the Balcones Fault Zone outcrop belt of the San Marcos Platform. It is approximately equivalent to the upper Devils River Formation (platform-margin facies) and the Segovia Formation of the Edwards Plateau. Limestone and dolomitic limestone. Shallow subtidal to tidal-flat cycles. Honeycombed limestone interbedded with chalky to marly limestone and recrystallized limestone, bedded to massive, leached and collapsed intervals. Locally, pockets of red clay (terra rosa) in karst collapse features. Thin, dark-red soil and residual chert regolith covered with sparse vegetation. Lower 20 to 30 ft composes regional dense member, a dense argillaceous limestone; commonly thin, flaggy beds. Mappable bench (regional dense member) at contact with underlying Kainer Formation. Mud cracks preserved near lower contact. Upper contact is burrowed, disconformable. Fossils include pelecypods, gastropods, rudistids. Thickness ~130 to 150 ft.

Kk—Kainer Formation. The Kainer Formation is the lower unit of the Edwards Group in the Balcones Fault Zone outcrop belt on the San Marcos Platform. It is approximately equivalent to the lower Devils River Formation (platform-margin facies) and the Fort Terrett Formation of the Edwards Plateau. Limestone and dolomitic limestone. Shallow subtidal to tidal-flat cycles. Upper part contains common, hard grainstone interbedded with marly mudstone and wackestone; honeycomb porosity common; middle to lower part contains limestone, dolomitic limestone, and some leached evaporitic rocks and breccias in middle part. Some researchers include strata composing Walnut Formation, **Kw**, with lower part of Kainer Formation (**Kk**). Residual chert mantles uplands underlain by Kainer. Horizontal current laminations or low-angle cross-stratification present. Lower part is locally clayey, coarsely crystalline limestone. Fossiliferous; rudistids, caprinids, miliolids, oysters, and gastropods. Thickness ~250 ft.

Ks—Segovia Formation. The Segovia Formation is the upper unit of the Edwards Group in the eastern Edwards Plateau and is approximately equivalent to the Person Formation of the Balcones Fault Zone area of the San Marcos Platform and the upper Devils River Formation of the platform margin. Limestone, dolomitic limestone, and marl. Only minor outcrop areas in northwest part of map area. West of map area as much as 360 ft thick.

Kft—Fort Terrett Formation. The Fort Terrett Formation is the lower unit of the Edwards Group in the eastern Edwards Plateau and is approximately equivalent to the Kainer Formation and Walnut Formation of the Balcones Fault Zone area of the San Marcos Platform and the lower Devils River Formation of the platform margin. Lateral lithologic changes between Kainer and Fort Terrett deposits are gradational, related to minor facies changes. Limestone, dolomitic limestone, and marl. Shallow subtidal to tidal-flat cycles. Upper part contains some leached evaporitic rocks and breccias. Lower 20 to 40 ft are subtidal limestone that are approximately equivalent to the Walnut Formation (**Kw**) of the Balcones Fault Zone area.

Kdvru—upper Devils River Formation. The upper Devils River Formation is the upper part of the Edwards Group along the San Marcos Platform margin. It is approximately equivalent to the Person Formation of the Balcones Fault Zone outcrop belt of the San Marcos Platform and the

Segovia Formation of the Edwards Plateau. Limestone and dolomitic limestone. Shallow subtidal to tidal-flat cycles. Some rudistid mounds. Thickness ~200 to ~250 ft.

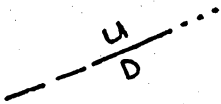
Kdvrl—lower Devils River Formation. The lower Devils River Formation is the upper part of the Edwards Group at the San Marcos Platform margin. It is approximately equivalent to the Kainer Formation of the Balcones Fault Zone outcrop belt of the San Marcos Platform and the Fort Terrett Formation of the Edwards Plateau. Limestone and dolomitic limestone. Shallow subtidal to tidal-flat cycles. Upper part contains some leached evaporitic rocks and breccias. Lower 20 to 50 ft is nodular limestone. Thickness ~350 to ~400 ft.

Kw—Walnut Formation. Limestone, marl, and dolomitic limestone; undifferentiated Bull Creek and Bee Cave Members; upper Bee Cave Member consists of fossiliferous marl, *Exogyra texana* common; Bee Cave Member thins and may pinch out toward the southwest; along steep slopes the marly Bee Cave Member commonly supports denser vegetation than does the overlying Kainer Formation; lower Bull Creek Member comprises limestone and dolomite interbedded with some marl; gastropods common; *Exogyra texana*; gradational contact with underlying Glen Rose Formation. Cream to light yellowish brown. Karst locally; some honeycomb porosity. Some researchers include **Kw** as lower part of Kainer Formation (**Kk**) southwest of Hays County. Formation as much as 30 to 50 ft thick.

Kgru and Kgrl—Glen Rose Formation. *Corbula* interval divides the formation into upper and lower parts. C on map indicates locality of *Corbula* observed in outcrop. Limestone, dolomitic limestone, and marl. Shallow subtidal to tidal-flat cycles. Alternating resistant and recessive beds forming stair-step topography; limestone, wackestone, packstone, grainstone, hard to soft and marly, 3- to 10-ft-thick, upward-shoaling cycles common, light gray to yellowish gray; dolomite, fine grained, porous, yellowish brown; locally burrowed; local honeycomb porosity; marine megafossils include molluscan steinkerns, rudistids, oysters, and echinoids; local dinosaur tracks. Upper part, **Kgru**, relatively thinner bedded, more dolomitic, and less fossiliferous; some intervals of disturbed bedding and collapse breccia possibly caused by evaporite solution; thickness about 400 ft. Lower part, **Kgrl**, commonly more massive, contains some rudistid reefs and

mounds. *Corbula* interval at top with abundant steinkerns of *Corbula harveyi* (Hill) in one to three thin, resistant, 1- to 3-ft-thick beds composing an interval as much as 15 ft thick; thickness ~200 to ~270 ft. Thickness of entire formation ~650 ft.

Map Symbols



Fault; U, upthrown side; D, downthrown side; dashed where relatively less distinct than solid; dotted where covered.



Doline. Probable karst-related collapse or subsidence of bedrock.



Strike and dip of beds dipping between 2° and 6°