BUREAU OF ECONOMIC GEOLOGY
SCOTT W. TINKER, DIRECTOR
JACKSON SCHOOL OF GEOSCIENCES
THE UNIVERSITY OF TEXAS AT AUSTIN
In cooperation with the STATEMAP component of the National Cooperative Geologic Mapping Program, administered by the U.S. Geological Survey

Figure 1. Location of map area.

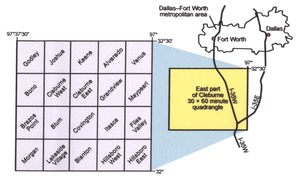


Figure 2. Setting and quadrangles for map area.

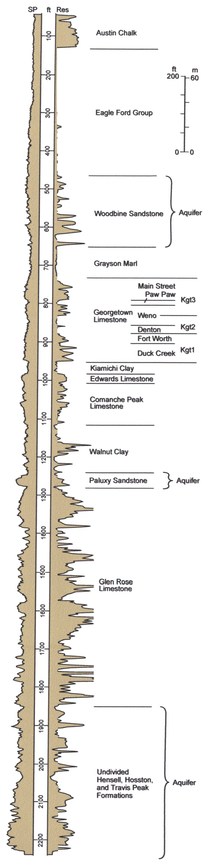


Figure 3. Geophysical log of J. L. Myers—Files Valley Water5. Corporation No. 2 well displaying SP (spontaneous potential) and resistivity responses for the subsurface stratigraphy in theeast part of the map area. Kgt 1, 2, and 3 incaote informal map subdivisions of the Georgetow.Formation.

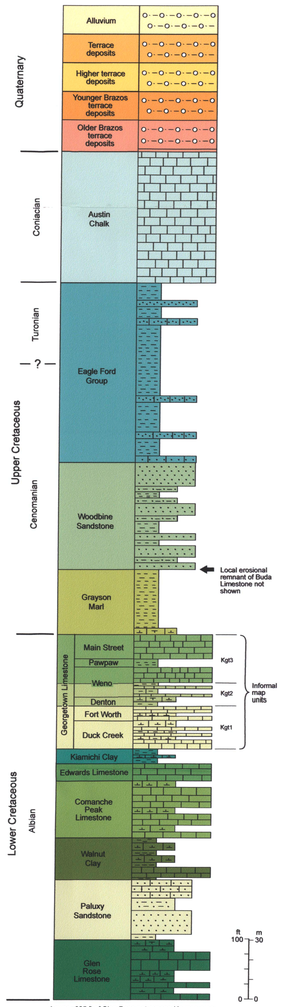
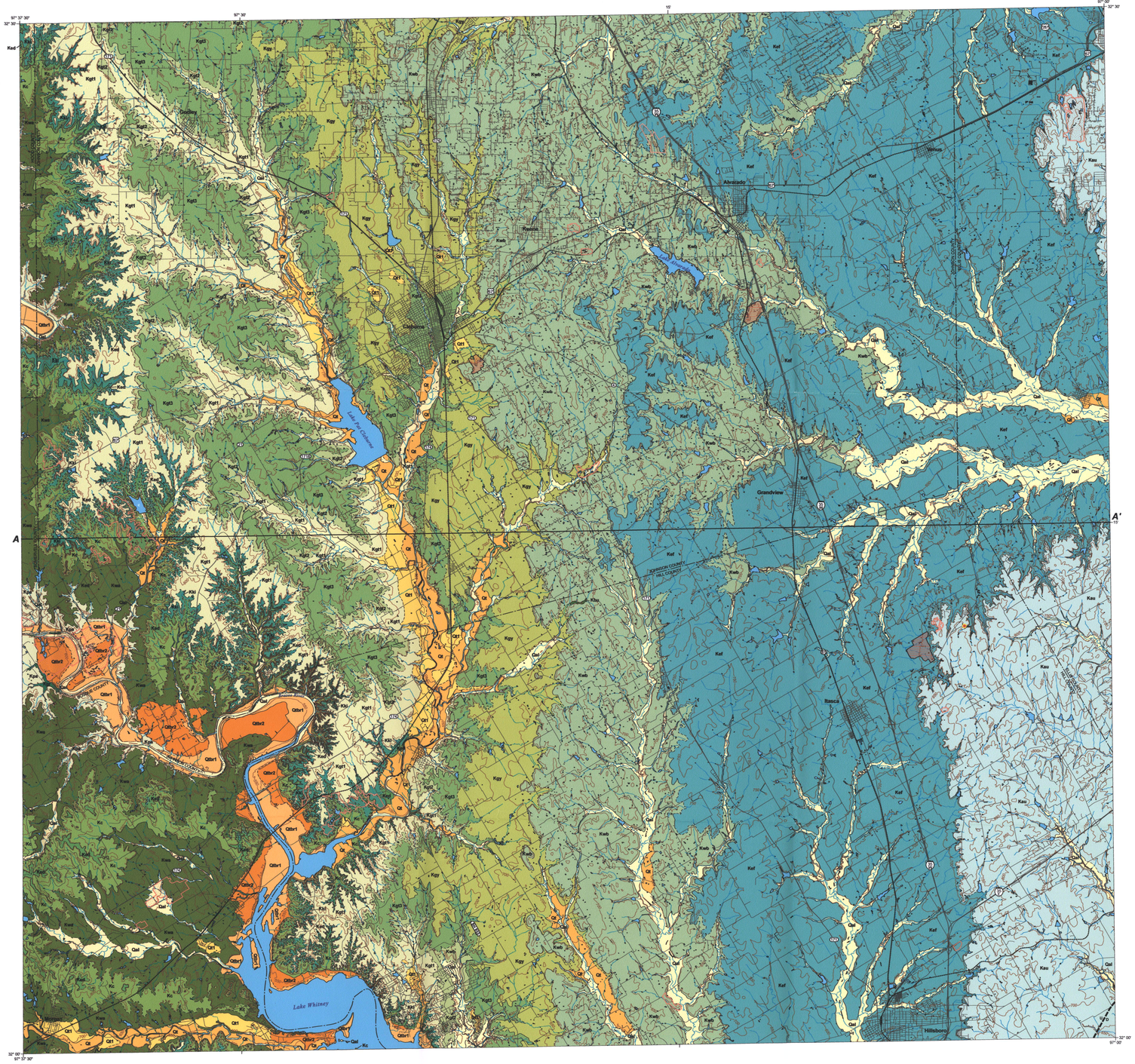


Figure 4. Generalized stratigraphic column.

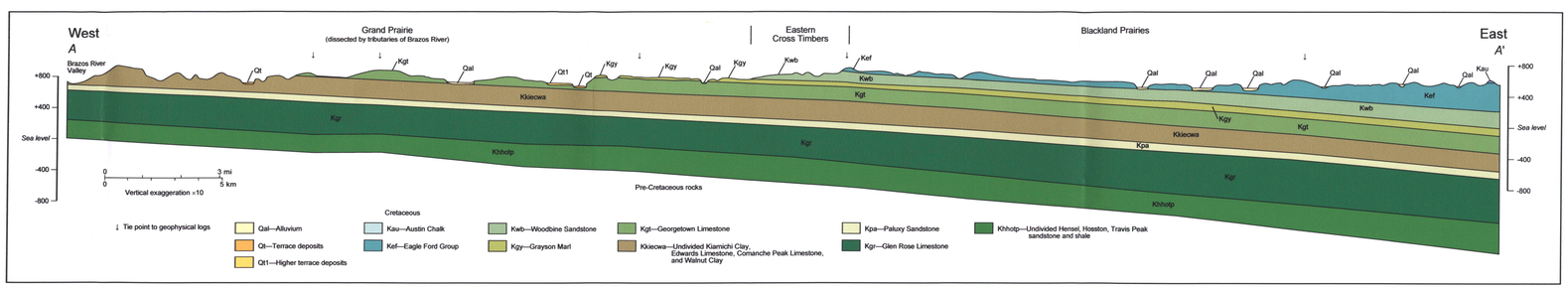


GEOLOGIC MAP OF THE EAST PART OF CLEBURNE, TEXAS, 30 × 60 MINUTE QUADRANGLE: SOUTH FORT WORTH–INTERSTATE 35W CORRIDOR

Edward W. Collins and Robert W. Baumgardner Jr.

2011

SCALE 1:100,000



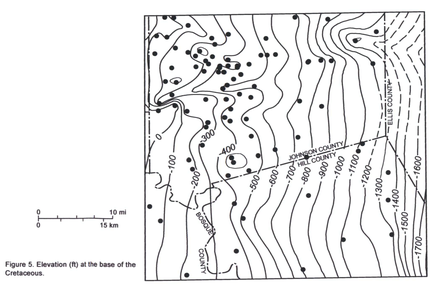


Figure 5. Elevation (ft) at the base of the Cretaceous.

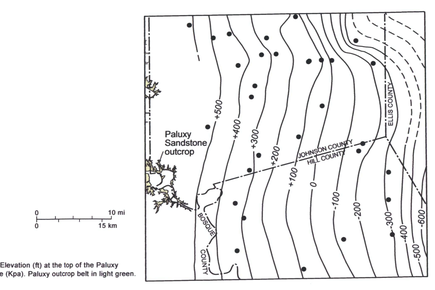


Figure 6. Elevation (ft) at the top of the Paluxy Sandstone (Kpa). Paluxy outcrop belt in light green.

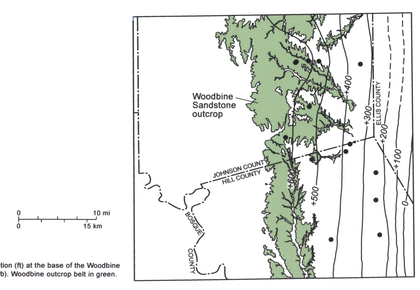


Figure 7. Elevation (ft) at the base of the Woodbine Sandstone (Kwb). Woodbine outcrop belt in green.

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Computer Illustrato-John T. Ames

GEOLOGIC MAP OF THE EAST PART OF CLEBURNE, TEXAS, 30 × 60 MINUTE QUADRANGLE: SOUTH FORT WORTH–INTERSTATE 35W CORRIDOR
OPEN-FILE MAP

QUATERNARY

Qal—Undivided alluvium. Sand, silt, clay, and gravel.

Qt—Terrace deposits of streams. Sand, silt, clay, and gravel.

Qt1—Higher terrace deposits of streams. Sand, silt, clay, and gravel.

Qtbr1—Younger terrace deposits of Brazos River. Sand, silt, clay, and gravel; generally 10 to 30 ft above floodplain. Potential source of sand and gravel.

Qtbr2—Older terrace deposits of Brazos River. Sand, silt, clay, and gravel; generally 30 to 50 ft above floodplain. Potential source of sand and gravel.

UPPER CRETACEOUS

Kau—Austin Chalk. Chalk and marl; marine megafossils; middle part is marl rich with chalk interbeds; thin bentonitic layers in lower part; as much as 200 ft (lower Austin Chalk) thick in map area; about 450 ft thick in subsurface east of map area. Thin (few inches to 3 ft) interval at base of Austin Chalk, and top of Eagle Ford Group is sandstone and conglomerate composed of quartz, glauconite, phosphate nodules, teeth, skeletal material, and carbonized wood. Austin Chalk local shallow groundwater source. Potential lime and stone resource. Selected references: Allen (1975), Dawson and others (1983), Collins and others (1992), Hovorka (1998), and Mace (1998).

Kef—Eagle Ford Group. Shale and minor sandstone and sandy limestone; marine megafossils; lower part bentonitic; septerian concretions in upper part locally; thickness about 300 ft. Unit weathers to thick clay-rich soils with shrink-and-swell characteristics. South Bosque Marl (upper) and Lake Waco Shale (lower) subdivisions are undivided in map area. Selected references: Adkins and Lozo (1951), Allen (1975), Hayward (1988a), and Hovorka (1998).

Kwb—Woodbine Sandstone. Sandstone and some shale and clay. Upper part mostly ferruginous, fine–grained sandstone; some medium- to coarse–grained sandstone; crossbeds. Lower part mostly interbedded fine–grained sandstone, shale, and clay; local thin beds of medium–grained sandstone to conglomerate at north part of map area; sandstone ferruginous to gray. Unit sometimes contains limonite and hematite–cemented layers and concretions sometimes referred to as *ironstone*. Generally less than 200 ft thick. Lewisville (upper) and Dexter (lower) subdivisions are undivided within map outcrop belt. Aquifer and potential sand resource. Base of Woodbine marks unconformity with underlying Grayson Marl. Erosion remnant outlier of Buda Limestone (Kbu) mapped by Adkins and Lozo (1951) beneath Woodbine at one location. Selected references: Adkins and Lozo (1951), Lee (1958), Oliver (1971), Hayward (1988a), and Ambrose and others (2009).

Kbu—Buda Limestone. Limestone. Small erosion remnant outlier. Selected reference: Adkins and Lozo (1951).

Kgy—Grayson Marl. Calcareous clay and marl and some thin limestone beds; weathers to thick clay-rich soils with shrink-and-swell characteristics; outcrops not common; as thick as 100 ft. Contacts with overlying and underlying units generally covered. Equivalent to Del Rio Clay south of map area. Selected references: Hayward and Brown (1967), Hendricks (1967), Hayward (1988b), Salvador and Quezada Muneton (1989), and McFarlan and Menes (1991).

LOWER CRETACEOUS

Georgetown Limestone. Limestone, argillaceous limestone, lesser marl and shale, some minor sandstone. Thickness as much as 200 ft; deposits thin southward and thicken in subsurface eastward. Three informal map units listed below: **Kgt1, Kgt2, Kgt3**. Equivalent to (descending order) Main Street, Pawpaw, Weno, Denton, Fort Worth, and Duck Creek Formations north of the map area. Selected references: Hayward and Brown (1967), McGill (1967), Brown (1971), Scott and others (1978), and Hayward (1988b).

Kgt3—upper Georgetown Limestone. Limestone, some argillaceous limestone, calcareous claystone and mudstone, and minor sandstone; nodular and planar/even bedding; burrows; common marine megafossils include bivalves, echinoids, gastropods, and ammonites; 60 to 80 ft thick. Limestone beds form topographic benches in some areas. Equivalent to upper Weno, Pawpaw, and Main Street Formations north of study area.

Kgt2—middle Georgetown Limestone. Clay, marl, and argillaceous limestone interval; *Gryphea* abundant locally; about 20 to 40 ft thick. Equivalent to Denton and lower Weno Formations north of map area.

Kgt1—lower Georgetown Limestone. Mostly limestone and some argillaceous limestone; nodular and planar/even bedding; burrows; common marine megafossils include bivalves, echinoids, gastropods, and ammonites; 60 to 80 ft thick. Equivalent to Duck Creek and Fort Worth Formations north of map area.

Kki—Kiamichi Clay. Calcareous clay, argillaceous limestone, and some thin (few inches thick) minor sandstone; oyster fossils common; about 25 ft thick. Although Hayward and Brown (1967) and Hayward (1988b) reported the *Kiamichi* to be a lower member of the Washita Georgetown Formation, Salvador and Quezada Muneton (1989) considered the Kiamichi to be upper Fredericksburg deposits. Additional reference: Bishop (1967).

Ked—Edwards Limestone. Limestone; fossiliferous; rudists; about 30 ft thick. Potential lime and crushed aggregate resource. Selected references: Hayward and Brown (1967), Hayward (1988b), and McFarlan and Menes (1991).

Kc—Comanche Peak Limestone. Limestone and argillaceous limestone; nodular bedding common; fossiliferous; about 90 ft thick. Potential limestone resource. Selected references: Hayward and Brown (1967), Hayward (1988b), and McFarlan and Menes (1991).

Kwa—Walnut Clay. Calcareous clay, argillaceous limestone, and limestone; fossiliferous; some thin (<2 ft thick) *Gryphaea* beds. Thickness as much as 70 ft. Selected references: Hayward and Brown (1967), Flatt (1976), Hayward (1988b), and McFarlan and Menes (1991).

Kpa—Paluxy Sandstone. Sandstone, mudstone, and lesser limestone. Quartz sandstone fine- to very fine grained; calcite cement; planar and trough crossbeds; some silicified wood. Sandy limestone in upper part of unit. Thickness as much as 100 ft; thins toward the south and east. Selected references: Atlee (1962), Hayward and Brown (1967), Caughey (1977), Owen (1979), and Hayward (1988b).

Kgr—Glen Rose Limestone. Limestone and argillaceous limestone; fossiliferous; only upper part of unit exposed near Brazos River in west part of study area. Selected references: Nagle (1968), Hayward and Brown (1967), Hayward (1988b), and McFarlan and Menes (1991).

Unit contact; contacts drawn as solid lines are relatively more distinct in the field and on aerial photographs than those drawn as dashed lines
Approximate contact
?—?— Approximate queried contact
Fault approximate; U, upthrown side; D, downthrown side
Cleburne State park boundary
400 Elevation; contour interval 50 ft
Road
Railroad
Landfill area
Surface area disturbed by quarry operations
Stream, lake
J. L. Myers - Files Valley Water Supply Corporation well No. 2

ABSTRACT

This geologic map of the east part of the Cleburne 30 x 60 minute quadrangle, scale 1:100,000, has been constructed through mapping and digital compilation of twenty 1:24,000-scale geologic work maps. The map and related data provide a basic geologic framework to aid in managing water and Earth resources, planning land use, identifying aquifer recharge areas, and identifying sources of aggregate and other Earth resources. Geology of the area consists of Cretaceous (Albian to Coniacian) limestone, argillaceous limestone, marl, shale, and sandstone exposed across the study area, composing more than 1,500 ft of Cretaceous shelf and shore-zone deposits. This stratigraphy includes the Woodbine and Paluxy Sandstones, sources of sand within the unit's outcrop belt and important aquifers in the subsurface. Edwards and Comanche Peak Limestones are also resources for lime and aggregate. Some local limestone aggregate pits are within the Georgetown Formation as well.

SUMMARY

The Geologic Map of the East Part of the Cleburne 30 × 60 Minute Quadrangle, South Fort Worth–Interstate 35W Corridor, scale 1:100,000, presents basic geologic information that can be used by laypersons, as well as professionals, who are involved in managing Earth and water resources, planning land use, and designing construction projects. The map area borders the Dallas–Fort Worth metropolitan area, the second-largest urban area in Texas, and is crossed by Interstate 35W, a major north-south road corridor through Texas (figs. 1 and 2). U.S. Highway 67 is a major northeast-southwest-trending transportation route across the area that links the study area to Dallas.

The map area consists of hilly and flat terrain and contains three distinct, north- to south-trending, physiographic belts described in some of the classic works of R. T. Hill (1900, 1901). The physiographic provinces include, from east to west: the Blackland Prairies, Eastern Cross Timbers, and Grand Prairie. The west margin of the map area is also crossed by the Brazos River Valley. In general, soils of the physiographic areas are linked to the surface geologic units that are exposed within north- to south-trending outcrop belts. Within the Grand Prairie, rocky soils are developed on limestone units, and some clay-rich soils are developed on units that contain clay, marl, and shale. The hilly Eastern Cross Timbers, coinciding on its west margin with a west-facing cuesta, contains post oak woods and sandy soils developed on the Woodbine Sandstone. In the west part of the Blackland Prairies, Eagle Ford Shale has weathered to form relatively deep, black, clay-rich soil. The Blackland Prairie also contains a west-facing escarpment up to 200 ft high. This Whiterock Escarpment is capped by Austin Chalk, which overlies Eagle Ford Shale at the escarpment.

Geologic units exposed across the map area comprise about 1,500 ft of Cretaceous marine shelf and shore-zone deposits (figs. 3, 4, and cross section). These strata dip gently east-southeastward toward the East Texas Basin and lie west of major fault zones bounding the East Texas Basin (Reaser and Collins, 1988; Ewing, 1991). Lying beneath the Cretaceous rocks in the subsurface are Paleozoic rocks and the buried Ouachita Fold and Thrust Belt (Flawn and others, 1961).

Depositional facies of the mapped Cretaceous deposits and the effects of cyclic relative-sea-level fluctuation on them have been well documented by previous workers (Hayward, 1988a, b; McFarlan and Menes, 1991; Sohl and others, 1991; Scott, 1993; Yurewicz and others, 1993). The exposed Lower Cretaceous rocks record deposition of three actatal groups: the Trinity, Fredericksburg, and Washita. Only the uppermost limestone and marl of the Glen Rose, upper Trinity Group, are within the map area. Hayward (1988a) reported that upper Glen Rose strata studied near the map area indicate deposition at a marine shelf to basin transition zone. He noted that sandy limestone layers of the uppermost Glen Rose indicate regression near the end of Glen Rose deposition. Overlying Fredericksburg Group strata, composed of Paluxy sandstone, Walnut Clay and limestone, Comanche Peak limestone, and rudist-bearing Edwards limestone, record another transgression marked by initial sand deposition, followed by marl and limestone deposition in estuarine and normal marine conditions. Washita Group strata above the Fredericksburg Group also record relative-sea-level fluctuations. Lower Washita rocks are composed of Kiamichi clay and Georgetown limestone, argillaceous limestone, and lesser clay and marl. Georgetown strata are equivalent to the stratigraphic section north of the map area that is composed of Duck Creek limestone, Fort Worth limestone, Denton clay, Weno limestone and shale, and Main Street limestone (Hayward and Brown, 1967; Hayward, 1988a; Salvador and Quezada Muneton, 1989; McFarlan and Menes, 1991). Georgetown rocks within the map area have been subdivided into three informal subdivisions for mapping: Kgt1, a lower limestone and lesser argillaceous limestone interval; Kgt2, a middle clay, marl, and lesser limestone interval; and Kgt3, an upper limestone and lesser argillaceous limestone and marl interval (figs. 3, 4, and explanation).

Upper Washita strata are composed of Grayson shale and marl, which mark the lower part of the Upper Cretaceous. Most upper Washita Buda deposits were eroded from this area prior to Woodbine deposition, although one minor erosional remnant of Buda limestone was noted by Adkins and Lozo (1951). Above this basin margin unconformity, the Upper Cretaceous strata are composed of the Woodbine Sandstone, Eagle Ford Group, and Austin Chalk. Woodbine sandstone, shale and clay were deposited in a barrier and prodelta-shelf setting (Oliver, 1971; Hayward, 1988b). Overlying the basin margin unconformity at the top of the Woodbine is Eagle Ford Group shale that was deposited within a shelf setting (Adkins and Lozo, 1951; Hayward, 1988b). The upper contact of the Eagle Ford is another basin margin unconformity with the Austin Chalk. Austin chalk, marl, and limestone were deposited in an open-marine setting (Dawson and others, 1983; Hovorka, 1998).

Locally overlying the Cretaceous bedrock units in the study area are stream alluvium and terrace deposits. Terrace deposits consist of the broad, well-developed terraces at varied elevations adjacent to the Brazos River and terraces associated with some of the larger tributary streams and creeks. Although the deposits are relatively minor, these local units have supplied some needed sand and gravel resources to the region. Other important Earth resources include Cretaceous limestone for lime and aggregate. Edwards and Comanche Peak limestone are resources for lime and aggregate. Some local limestone pits are within the Georgetown Formation as well. Woodbine and Paluxy Sandstones are sources of sand within the unit's outcrop belts, as well as being important aquifers in the subsurface (Hall, 1976; Baker and others, 1990). Sandstones at the base of the Cretaceous section compose another important aquifer for the area, the Trinity aquifer (fig. 3). The base of Cretaceous rocks marks the base of fresh and usable quality (3,000 tds) water for the map area. Figures 5 to 7 illustrate the elevations of the base of the Cretaceous rocks, the top of the Paluxy sandstone aquifer, and the base of the Woodbine sandstone aquifer. Lower Cretaceous limestone intervals may also be water bearing and Austin chalk also contains ground water locally (Mace, 1998).

Geological considerations are key to managing and planning use of land and to designing construction projects within the map area. In their statewide mapping (1:500,000 scale) of land resources of Texas, Kier and others (1977) mapped geohydrologic, mineral-land, physical-property, geomorphic, process, and biological units and noted characteristics of the units. These land-resource units relate in general to surface geology, and this geologic map can be used in conjunction with the statewide larger-scale land-resource map to review land-use properties of the geologic units. For example, within the map area, the Eagle Ford and Grayson outcrop belts are expansive clay-mud areas. Some general properties are high shrink-swell potential and infiltration capacity and low slope stability and foundation strength. The Woodbine Sandstone is an aquifer recharge area with high to moderate infiltration capacity and foundation strength and low to moderate shrink-swell capacity. The outcrop belts of the Glen Rose through Georgetown units in the western map area are composed mostly of hard limestone and limy mud, wherein general slope stability and foundation strength may be high in limestone areas and low to moderate in limy mud areas. Infiltration may be moderate in limestone areas and low to moderate in limy mud. The Austin Chalk and Edwards Limestone, east and west parts of the study area, respectively, are massive limestones with the potential to be mined for lime used in cement. A few general properties are high foundation strength and slope stability and moderate to difficult excavation potential.

METHODS AND ACKNOWLEDGMENTS

Geology illustrated on this map is based on field and aerial-photograph interpretations after review of previous work about the area's geology. These include works cited in the summary and within this map's explanation, as well as two previous regional maps, the 1:250,000-scale Dallas Sheet (McGowan and others, 1972) and the 1:174,000-scale geologic map of Johnson County (Winton and Scott, 1922). Twenty 1:24,000-scale geologic quadrangle work maps were constructed and digitized to produce this 1:100,000-scale map of the east part of the Cleburne 30 × 60 minute quadrangle. The topographic base was created from digital files of the Texas Natural Resources Information Services (TNRIS) for U.S. Geological Survey 7.5-minute topographic quadrangle maps (fig. 2). Digital files of roads, railroads, county boundaries, drainage, and lakes were also obtained through TNRIS. Shallow geophysical logs aided in refining of mapping for areas with thick vegetation, soil cover, and limited outcrops and aided in construction of the cross section and inset maps.

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