BUREAU OF ECONOMIC GEOLOGY
SCOTT W. TINKER, DIRECTOR
JACKSON SCHOOL OF GEOSCIENCES
THE UNIVERSITY OF TEXAS AT AUSTIN
In cooperation with the State of Texas Advanced Resource Recovery (STARR) Program and the U.S. Geological Survey National Cooperative Geologic Mapping Program under STATEMAP award No. G22AC00495, 2023



SURFICIAL DEPOSITS

Qal—Alluvium (Holocene)—Gravel, sand, clay, silt, and organic material. Stream and floodplain deposits generally unconsolidated or weakly cemented sediments along active stream and river channels. Locally bedrock exposed.

Qat—Alluvium and terrace (Holocene)—Gravel, sand, silt, and clay. Unconsolidated or weakly cemented sediments on irregular treads adjacent and <10 ft elevation from active stream channels. Likely eroded older terrace deposits modified by modern flood sediments (Qal). Often contains well-developed soils and vegetation.

Qt1—Terrace 1 (Pleistocene)—Gravel, sand, silt, and clay. Well-defined benches. Poorly cemented fluvial deposits <50 ft above active floodplain.

Qt2—Terrace 2 (Pleistocene)—Gravel, sand, silt, and clay. Well-defined benches. Poorly cemented fluvial deposits <70 ft above active floodplain.

Qtu—Terrace undivided (Pleistocene)—Gravel, sand, silt, and clay. Well-defined benches. Poorly cemented fluvial deposits above active floodplain.

Qhg—High Gravels (Pleistocene)—Gravel, sand, silt, and clay. Potentially the highest level terrace deposit with poor definition, often >50 ft above active floodplain. Transitions into poorly sorted, caliche-cemented, angular to rounded rock fragments of locally derived colluvium.

UNCONFORMITY

FREDERICKSBURG-WASHITA DIVISION
Edwards Group (Cretaceous)

Kfl—Fort Lancaster Formation (Cretaceous)—Limestone and dolomite. Rudist, miliolid, shell-fragment, pellet grainstone to wackestone with chert and dolomite. Contains discontinuous rudistid reef (bioherm) boundstones (Smith and others, 2000). Thickness of the Fort Lancaster Formation in the study area ranges from approximately 375 ft (Spice, 1954) to 475 ft thick (Smith, 1964; Smith and others, 2000). The Fort Lancaster Formation defined in this study area is equivalent to the Segovia Formation previously described by Rose (1972) and mapped by Waechter and others, (1977), Rose and others (1981), and Webster (1982). However, Rose (1972) noted that the "Segovia" equivalent units west of his map area (such as northern Val Verde County) consist of thick beds of rudist and miliolid limestone separated by intervals of ammonite-bearing marl. He postulated that the rocks reflected a more open marine origin and probably should be given a formal name to distinguish them from the Segovia. The Fort Lancaster Formation is described and mapped by Smith and others (2000) throughout northern Val Verde County. The Fort Lancaster Formation transitions regionally from a fossiliferous marly and slope-forming unit in the northwest, dipping down into the study area as a bluff-forming rudistid limestone, before transitioning completely into the Devils River Formation immediately to the south of the study area (Smith and others, 2000). Smith and others (2000) describes the transition of the Fort Lancaster Formation to Segovia Formation as occurring about halfway through a change from a predominantly limestone of the Fort Lancaster Formation to a predominantly mixed limestone, dolomite, and evaporite unit of the Segovia Formation. This is consistent with Rose (1972), which describes the Segovia Formation as heterogeneous but consisting of a dolomitic sequence above the Fort Terrett Formation and below the Buda Limestone. Two regionally distinct and mappable units within the Fort Lancaster Formation in the quadrangle include the upper slope-forming Calvert Zone (CZ) and the basal fossiliferous marly Burt Ranch Member (Waechter and others, 1977; McKalips and others, 1981).

Kfl(cz)—Calvert Zone Member (Cretaceous)—Marly limestone. Yellowish, unfossiliferous marly limestone, recessive and forms barren hillslopes and plateaus (Calvert, 1928; Spice, 1954). A black limestone ("Black Bed") caps the unit for a total thickness about 10–15 ft (Smith, 1964). The informally defined unit occurs about 300 ft above the base of the Fort Lancaster Formation and near the top of the plateau. The zone forms a concave slope with a dark vegetative band at the top. The "Calvert Zone" is a grassy slope capped by about 1 ft of resistive black bed limestone. In western Val Verde County a red-stained bed is in the exact same stratigraphic position above a slope break and vegetative band and is called the Humble Oil "Red Bed" (Smith and others, 1964). The unit is regionally mapped in Waechter and others (1977) and McKalips and others (1981) and is equivalent to the thin key marker "Black Bed" described by Rose (1972). In the quadrangle, the Calvert Zone is mapped where a break in slope is combined with vegetative bands below barren zones on hillslopes and plateaus. This zone is most evident using historic (1940-50's) aerial photographs combined with lidar and slope maps.

Kfl(br)—Burt Ranch Member (Cretaceous) (Not shown on map)—Nodular, marly, fossiliferous wackestone. The unit is sparsely fossiliferous and contains E. Texana (oyster) and ammonites representative of *Manuaniceras powelli* zone (Smith and others, 2000). The unit is a generally recessive and argillaceous (marly) unit that forms a distinctive mapping horizon where exposed. The unit defines the basal Fort Lancaster Formation (Segovia Equivalent). The rich and diverse molluscan faunas with scattered ammonites indicate deposition on a shallow open shelf (Rose, 1972) and thus represents a distinctly more open marine depositional condition than the (restricted) underlying Kirschberg Evaporite Member of the Fort Terrett Formation. The contact with the underlying (Fort Terrett Formation) is sharp and often iron-stained and bored. The upper contact of the Burt Ranch member is poorly defined and likely transitional. The unit is up to about 20 ft thick in the study area. The Burt Ranch member is the only regional mappable marker bed within the Edwards Plateau (Smith and others, 2000). The Burt Ranch Member is equivalent to the lower Sue Peaks Formation in the Big Bend area of West Texas, and to the Regional Dense Member of the Person Formation along the Balcones Fault Zone of Central Texas (Rose, 1972; Smith and others, 2000). The unit cannot be mapped to the south into the units of the Maverick Basin. Thus, the southern extent of the unit defines the northern boundary of the Devils River Formation that rims the Maverick Basin (Smith, 1964; Smith and others, 2000).

Kft—Fort Terrett Formation (Cretaceous)—The formation is heterolithic, composed of miliolid, pellet, shell fragment, clams, gastropod, and rudistid grainstone to wackestone, chert, and dolomite (Smith and others, 2000). In the study area along portions of Dolan Creek the top of the Fort Terrett Formation is defined by a distinctive resistant bed about 2 ft thick with numerous silicified Turritella (high-spired gastropod) fossil forms. The Fort Terrett is subdivided into four intergradational members. Only part of the topmost member (Kirschberg Evaporite) is likely exposed in the study area (Rose, 1972). Total Fort Terrett Formation thickness is approximately 300 ft in the study area (Smith, 1964; Rose 1972).

Kft(ke)—Kirschberg Evaporite Member (Cretaceous) (Not shown on map)—Limestone and dolomite. Porcelaneous aphanitic limestone, collapse breccia, chert, and recrystallized limestone (Barnes, 1944; Rose; 1972; Waechter et al., 1977). The member in the study area is poorly defined, but it is generally thought to compose the upper part of the Fort Terrett Formation (Smith, 1964). Only the upper 50 ft of the unit is exposed along Devils River and Dolan Creek (Spice, 1954). A cavernous zone defined by Spice (1954) consists of recrystallized limestone and layers of chert, and it appears to correspond generally to the perennial springs along Devils River and Dolan Creek. The same cavernous horizon is locally exposed along sections of Dolan Creek and provides recharge features. Regionally, this zone may be hydrogeologically important to the aquifer. A thin, continuous, and distinctive chert bed underlies the cavernous zone and the Finegan Springs complex.

Map Symbols

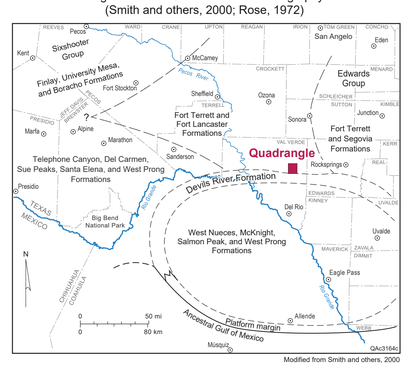
- Contact
- Contact approximate
- Contact inferred
- Contact concealed
- Improved road
- Local road
- CZ (Calvert zone)
- Intermittent stream
- Lineament, fracture zone (Webster, 1982)
- Measured section
- Slickenside
- Fracture
- Fracture-vertical
- Fault
- Fault trend
- Bedding strike and dip
- Closed depression >1m depth
- A—A' Cross section
- 3.8 Passive seismic (depth to bedrock, ft)
- 1444 x Top Fort Terret, elevation (ft-msl)
- Borehole geophysics
- Fossil locality
- Pit, quarry
- Sink (Karst)
- Closed depression
- DRSNA trail
- Spring
- Stream gage with surveyed elevation
- Stream gage (USGS, IBWC)
- Weather station
- Well-collapsed; well-dry
- Well, Well-domestic; well-pws; well-stock
- Well-monitor
- P&A oil well
- DRSNA camping
- Parking
- Park Headquarters

Correlation of Map Units

Chrono-stratigraphy	Lithostratigraphy: Edwards Plateau	Map Units		
Quaternary		Qal	Alluvium	Surficial deposits
		Qat	Alluviated terrace	
		Qt1	Terrace 1	
		Qt2	Terrace 2	
		Qtu	Terrace, undifferentiated	
		Qhg	High gravels	
Unconformity				
Lower Cretaceous	Upper Albian	Segovia Formation	Kfl	Calvert Zone (CZ) or Black Bed	Bedrock units
	Middle Albian			Fort Lancaster Formation	
	Comanchean			Burt Ranch Member Kfl (br)	
	Fredericksburg-Washita Division	Edwards Group (Rose, 1972)		Kirschberg Member	
		Fort Terrett Formation	Kft	Fort Terrett Formation	
				Basal Nodular Member	Subsurface

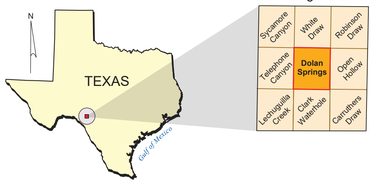
Lithostratigraphy and Chronostratigraphy modified from Rose, 1972; Waechter and others, 1977; Smith and others, 2000; and Kerans, 2002.

Regional Lower Cretaceous Lithostratigraphy (Smith and others, 2000; Rose, 1972)



Modified from Smith and others, 2000

Quadrangle location



SCALE 1:24,000

0 1 2 3 MILES
0 1 2 3 4 KILOMETERS

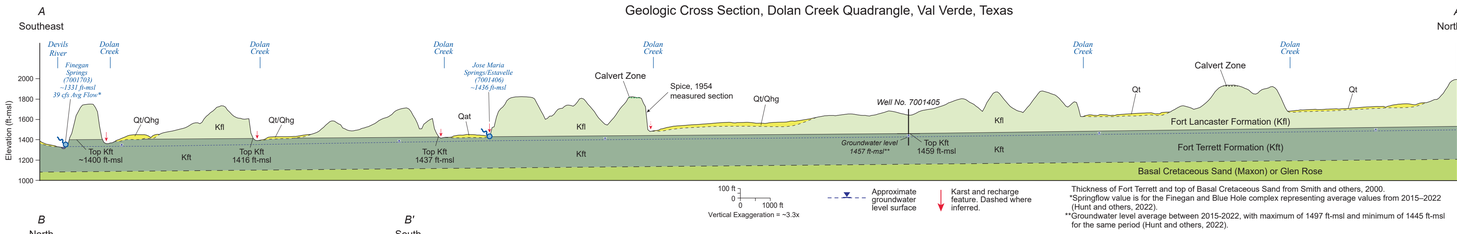
UNIVERSAL TRANSVERSE MERCATOR PROJECTION, ZONE 14N NAD 83
CONTOUR INTERVAL 20 FT
DATUM IS MEAN SEA LEVEL

GN MN
★ 4°55'
87 MILS
0°58'
17 MILS
UTM grid and 2023 Magnetic North (MN) declination at center of sheet

GEOLOGIC MAP OF THE DOLAN SPRINGS QUADRANGLE VAL VERDE COUNTY, TEXAS

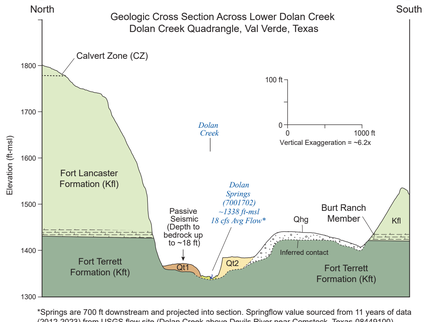
Brian B. Hunt, John R. Andrews, and Jeffrey G. Paine
2023

Geologic Cross Section, Dolan Creek Quadrangle, Val Verde, Texas



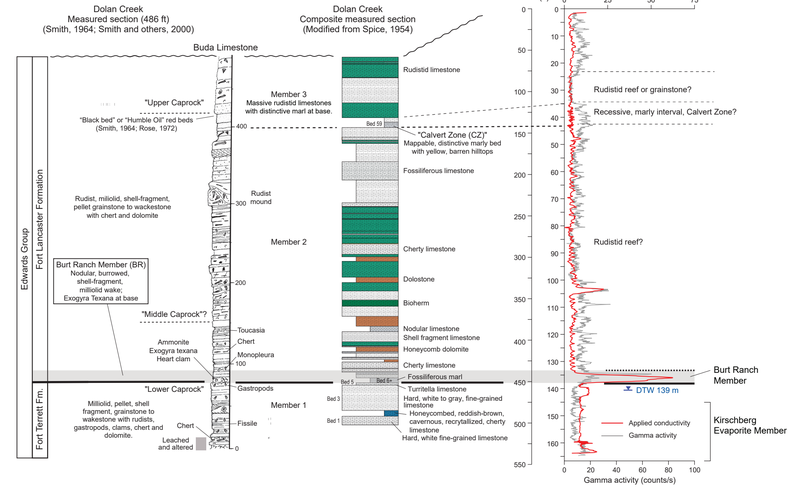
Thickness of Fort Terrett and top of Basal Cretaceous Sand from Smith and others, 2000.
*Springflow value is for the Finegan and Blue Hole complex representing average values from 2015–2022 (Hunt and others, 2022).
**Groundwater level average between 2015-2022, with maximum of 1497 ft-msl and minimum of 1445 ft-msl for the same period (Hunt and others, 2022).

Geologic Cross Section Across Lower Dolan Creek Quadrangle, Val Verde, Texas



*Springs are 700 ft downstream and projected into section. Springflow value sourced from 11 years of data (2012-2023) from USGS flow site (Dolan Creek above Devils River near Comstock, Texas-08449100).

Dolan Creek Measured section (486 ft) (Smith, 1964; Smith and others, 2000) / Dolan Creek Composite measured section (Modified from Spice, 1954)



UT Austin BEG Log
Log DS02 (Deep well no. 2; 70018041, Devils River SNA
Latitude 29.914326° N; Longitude 100.948683° W
Ground elevation: 570.44 m (1,871.5 ft) NAVD88

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