





ABSTRACT

The Welge-Lion Mountain (WGLM) aquifer is an important component of the Paleozoic aquifer system in central Texas; but is not officially recognized as a minor aquifer by the state. This study highlights its significance, particularly in the context of growing water demands and climate variability.

The WGLM aquifer was originally described in Bluntzer (1992) and comprises the Cambrian Welge and Lion Mountain members (also called mid-Cambrian aquifer). The Welge is a well-sorted homogeneous quartz arenite, while the Lion Mountain is a fine- to medium-grained, glauconitic green sandstone. The units represent a high-energy near-shore, shallow marine tidal flat, and possibly locally fluvial depositional environments. The units have a combined thickness of up to 90 feet within the Llano Uplift and radiate away from the uplift into the subsurface. They are faulted and segmented, similar to other Paleozoic aquifers. The WGLM is above the Cambrian Hickory Sandstone aquifer and below the Cambro-Orodovician Ellenburger-San Saba aquifer.

A query of the Texas Water Development Board (TWDB) well database, combined with data from the Hill Country Underground Water Conservation District, provided data for 260 wells completed in the WGLM for livestock, domestic, and public water supply. Data show WGLM wells producing across nine counties of the Llano Uplift region, with well depths ranging from 105 to 1207 feet, and yields ranging from 1.5 to 150 gallons per minute (gpm)--with an average yield of 41 gpm. The WGLM aquifer exhibits excellent water quality, with total dissolved solids (TDS) between 300 and 600 mg/L.

The WGLM aquifer satisfies the TWDB's definition of a minor aquifer because it supplies "relatively small quantities of water in large areas of the State." Recognizing its importance as a minor aquifer among the Paleozoic aquifers of the Llano Uplift will facilitate improved water resource planning, conservation, and management strategies.



Setting

Location map and simplified geologic map of central Texas. The WGLM aquifer is within the Cambrian (brown) exposures around the Llano Uplift. Source data: Geologic Atlas of Texas.

	Paleozoic and Mesoproterozoic Stratigraphy for Turtle Creek and Mason Quadrangles, Mason County, Texas						Minor Aquifers	
	Age	Litl	hostrati	graphy	Geologic Profile	Brief Map Unit Descriptions	ULIENDS	
0	Penssylvannian		alls Limestone Smithwick Shale	-		Smithwick Shale (IPsw): Black shale with minor limestone at base. IPmf(u): Dark gray fg-cg, fossiliferous (crinoid) limestone and minor shale. Marble Falls Limestone	Marble Falls	
600 —	-		Marble F	Barnett Shale Chapel Limestone	IPmf(I)	IPmf(I): Dark fg-mg, cherty, fossiliferous (crinoid) limestone and shale.		Stratigr
-	M-D					Barnett Shale (Mb): Dark gray mg-cg, fossiliferous limestones and shales. Chappel Limestone (Mcc): Cg, friable, crinoid grainstone.		column
1000 — 		dno	Gorman Fm.	Zesch/Bear Springs Fms. Houy FmIves Breccia	s. $\left \begin{array}{c} \mathbf{s}_{i} \\ \mathbf{s}_{i} $	Zesch/Bear Springs Fm (MDz-bs): Localized, discontinuous, fossiliferous, siliceous limestone.	Ellenburger- San Saba	Officiall clude th San Sab
1200 — - - 1400 — tec -	Ordovician	Ellenburger Gr	ard Fm.	Staendebach Mbr		Staendebach Mbr., and lower Gorman Formation, undivided; Og-ts: Light brown to gray cherty dolostones.		
Thickness (fe	-		Tanya	Threadgill Mbr	Ott	Threadgill Mbr (Ott): Brownish-gray, fossiliferous limestone with minor chert		
1800 — - -			Ē	San Saba Mbr		San Saba Limestone (Cws): Yellowish brown mg-cg, glauconitic, fossiliferous, calcarenite.		
2000 —	1		ns Fr		Cwp(b)	Bioherm facies; Cwp(b): Light gray, stromatolitic bioherms.		
	-		Wilberr	Point Peak Mbr		Point Peak Siltstone facies; Cwp: Yellowish to green-gray, thin, fg siltstones, sandstones, and grainstones.		
2200 —		dnc		Morgan Creek Mbr		Creek Upper facies: Greenish to purple, fg-cg, glauconitic, fossiliferous calcarenite. Limestone (Cwm) Lower facies: Pink to red, calcareous, glauconitic, fg-mg, quartz sandstone.	Welge-Lion Mnt	
-	Ę	Gr		Lion Mountain Mbr	Cri	Lion Mountain (Crl): Green- to dark brown, fg-mg, glauconitic, quartz arenite.		
2400 — - - 2600 — - -	Cambria	Cambria Moore Hollow	Riley Fm.	Cap Mountain Mbr	r construction of the second s	Upper facies: Olive gray, glauconitic, limestone (wackestone to grainstone). Cap Mountain Limestone Middle facies: Interbedded siltstone and calcarenite (Crc) Lower facies: Reddish, fg-cg, poorly sorted, glauconitic, calcite-cemented, sandstone		
2800 — - - 3000 —				Hickory Mbr	Crh(u) Crh(m) Crh(i) The Great	Crh(u): Deep red, mg-cg, well-rounded, moderately sorted, friable, hematite cemented sandstone Hickory Sandstone Crh(m): Light brown, fg-cg, quartz arenite. Crh(l): Brown, friable, fg-cg, conglomeratic, crossbedded quartz sandstone.	Hickory	
3200 — 	Meso- proterozoic				pCtm pCtr pCic pC not to scale	ty Town Mountain Granite (Suite); pCtm: Coarse-grained porophyritic granite. Lost Creek Gneiss; pClc: Granitic orthogniess Packsaddle Schist Domain (Supersuite); pCps: Schist and gniess		

WELGE-LION MOUNTAIN AQUIFER: REVISITING A MINOR AQUIFER OF THE LLANO UPLIFT AQUIFER SYSTEM, CENTRAL TEXAS

Brian Hunt¹, Allan Standen², Paul Tybor³, and Paul Babb³ (1)Bureau of Economic Geology, Jackson School of Geosciences, The University of Texas at Austin; (2)LRE Water, (3)Hill Country Underground Water Conservation District

aphic and hydrostratigraphic of the Llano Uplift region. recognized aquifers ine Marble Falls, Ellenburgera, and the Hickory.

Geology





Geologic cross section from the Monument Mountain SE quadrangle in Mason County, Texas. Figure from Hunt (2023). Detailed mapping and well data illustrates that many domestic and agricultural wells are completed within the WGLM aquifer, with most completed solely in the Welge member.

the Llano Uplift. Paleozoic-age faults segment and compartmentalize the aquifer.

The Welge member is the most-productive unit of the WGLM aquifer and has a thickness of 10-30 ft in the subsurface, similar to outcrop thickness.

Cuttings from the Welge Member within well 476428 at a depth of 290 ft.

91 WGLM wells in the TWDB database across 9 counties.

Additional 169 wells not on map in Gillespie County. Total of 260 WGLM wells in study compilation:

- Use: livestock, domestic, and public water supply.
- Depths: 105 to 1207 feet
- Yield: 1.5 to 150 gallons per minute (gpm); average of 41 gpm.
- Total dissolved solids (TDS): 300 and 600 mg/L.

The WLM aquifer satisfies the State's definition of a minor aquifer and is clearly a high-quality and important groundwater resource. Recognizing its importance as a minor aquifer among the Paleozoic aquifers of the Llano Uplift will facilitate improved water resource planning, conservation, and management strategies.

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Cuttings from Lion Mountain Member within well 114382 at a depth of 220 ft.

Example Ground Water Availability Study

Conclusions