

Era	Period	Rock units	Description	Thickness in feet	Sequence
Paleozoic	Lower(?) Paleozoic	Undifferentiated	Variably colored sandstone, typically poorly cemented	0 - \geq 135	
	Devonian	Undifferentiated	Gray, vuggy dolostone	0 - $>$ 35	Kaskaskia
	Middle Ordovician	Galena Group Wise Lake Fm.(?)	Gray, vuggy dolostone	0 - $>$ 27	Tippecanoe
		Dunleith Fm.	Gray, cherty dolostone	0 - \geq 57	
		Decorah Fm.	Gray-green shale with thin dolostone beds	0 - \geq 150	
		Platteville Formation	Brown dolostone with worm burrows	0 - \geq 14	
		Glenwood Formation	Gray-green shale	0 - \geq 12	
		St. Peter Sandstone	Sandstone, fine- to medium-grained, relatively mature, with shaley base	0 - 40	
	Upper Cambrian	Davis Formation	Shale with dolostone and local sandy and silty beds	0 - 95 ?	Sauk
		Wonewoc Sandstone	Sandstone, fine- to medium-grained	0 - 55	
		Bonnerterre Formation	Dolostone with minor shale, siltstone, and glauconitic sand	0 - 80	
		Mt. Simon Sandstone	Sandstone, fine- to medium-grained, with thin coarse-grained sand to fine-grained gravel layers	0 - \geq 19	
	Cambrian	Undifferentiated sandstones	Possibly granite- or quartzite-derived	0 - ?	
Precambrian	Sioux Quartzite	Pink to white, fine-grained to conglomeritic orthoquartzite with minor beds of red to purple catlinite	0 - $>$ 1000		
	Crystalline basement rocks	Gabbro, granite, metagabbro, and various other metamorphic rocks	0 - $>$ 1000		

—— Possible period of erosion or nondeposition

—— Period of erosion or nondeposition (unconformity)

Table 1. Generalized stratigraphic column of Precambrian and Paleozoic units in Lincoln and Union Counties, South Dakota

Era	Period	Rock units	Description	Thickness in feet		Cretaceous Cyclothem			
Mesozoic	Cretaceous	Upper	Niobrara Formation	Medium- to dark-gray limestone, chalk, and calcareous shale; locally pyritic, burrowed, containing some bentonite; fossiliferous	0 – 95	↑ -----Cretaceous undifferentiated rocks ----- Time equivalent to most of the Upper Cretaceous. Includes the Split Rock Creek Formation. ----- ↓ ? ----- ?	Niobrara		
			Carlile Shale	Codell Sandstone Member	Cross-bedded sandstone containing sharks teeth		0 - ?	Greenhorn	
				Blue Hill Member	Greasy, concretionary, organic-rich shale; contains bentonite		0 – 230		
				Fairport Chalk Member	Dark gray, fissile, greasy, calcareous shale; locally silty and burrowed		0 – 190		
			Greenhorn Limestone	Gray, silty, calcareous shale, calcarenite, and fossiliferous limestone	0 - 50		Dakota Formation		
			Graneros Shale	Gray-brown, waxy to gritty, slightly calcareous shale	0 – 70				
			Dakota Formation	Interbedded shale, siltstone, and sandstone with minor coal seams	0 – 415				
			Lower	None encountered				Kiowa-Skull Creek	
			Jurassic	None encountered					
	Triassic	None encountered							

===== Period of erosion or nondeposition (unconformity)

Table 2. Generalized stratigraphic column of Mesozoic units in Lincoln and Union Counties, South Dakota

Drill hole and location	Depth interval (in feet): Generalized description	Rock unit	Age
Wagner-Larson. MLN-280. NE SW SW NW sec. 22, T. 93 N., R. 50 W. Cross section M-M' in app. B.	330-581: Brown, white or pink sand, fine to coarse, subangular to subrounded, locally quartz-rich, some igneous grains, pyrite, calcite; chips of quartzite, dolostone, shale. Shaley intervals; intervals with black phosphate pellets; intervals containing coal and shells.	Unknown	Lower(?) Paleozoic
	581-585: Sand, white with pink grains, medium to coarse, angular to rounded, some pink feldspar and quartz. 585: Pink granite.	Granite-derived sand(?) Basement rock	Cambrian(?) Precambrian
Wagner No.1-Blanchard. MLN-317. NE NW NW NW sec. 29, T. 92 N., R. 49 W. Cross sections O-O' and DD-DD' in app. B.	360-495: Sand, very fine to coarse, angular to rounded, locally quartz-rich, some pyrite, siderite, calcite; chips of chert, dolostone, shale. Intervals with phosphate pellets.	Unknown	Lower(?) Paleozoic
	495-640: Shale, greenish-gray, locally calcareous. Silty or sandy intervals containing minor chert or dolostone chips. Trace anhydrite.	Galena Group, Decorah Formation	Ordovician
	640-675: Sand, white, fine to medium, upper part with frosted and etched quartz grains, lower part is shaley.	St. Peter Sandstone	Ordovician
	675-700: Shale, gray to grayish-green with interbedded limestone. Locally sandy areas.	Davis Formation	Cambrian
	700-755: Sand, white, medium, well-sorted. Upper part is calcite cemented; the lower part is shaley.	Wonewoc Sandstone	Cambrian
	755-814: Light gray limestone, locally dolomitic or cherty.	Bonnerterre Formation	Cambrian
	814-815: Black, carbonaceous fissile shale, slight oil show. 815-839: Sand, white to pink, fine to coarse, angular to rounded, some fine feldspar; lower part of heavily weathered granite. 839: Granite.	Mt. Simon Sandstone(?) Granite-derived sand and regolith Basement rock	Cambrian(?) Cambrian(?) Precambrian
Sioux Valley No.1-Lafleur. MLN-345. SW NE NW SW sec. 18, T. 90 N., R. 48 W. Cross sections Q-Q' and DD-DD' in app. B.	390-523: Gray dolostone with local, thin sand or limestone interbeds.	Unknown	Devonian(?)
	523-615: White to gray dolostone, locally cherty. Local thin sand or shale interbeds.	Galena Group	Ordovician
	615-765: Sandstone (uppermost part) and gray shale. Sandstone is cherty with gray dolostone and shell fragments. Shale is locally calcareous. Lowermost shale contains limestone chips.	Galena Group, Decorah Formation; lowermost shale – Platteville and Glenwood Formations?	Ordovician
	765-805: Sand, gray. Uppermost sand contains round, frosted quartz grains.	St. Peter Sandstone	Ordovician
	805-900: Interbedded limestone, sandstone, shale, and dolostone.	Davis Formation	Cambrian
	900-964: White sand, fine to medium. Local quartz rich zones. Intervals containing chips of dolostone, shale, and limestone. Under artesian conditions.	Wonewoc Sandstone	Cambrian
	964-1007: Gray to white dolomitic limestone.	Bonnerterre Formation	Cambrian
	1007-1015: Pink to red-brown sand, rounded, mostly quartz. 1015-1029: Sand, white, fine, angular to subangular, mostly quartz. 1029: Granite.	Mt. Simon Sandstone Granite-derived sand(?) Basement rock	Cambrian Cambrian(?) Precambrian
South Dakota Geological Survey hole R20-2002-1. NW NW NW NE sec. 13, T. 90 N., R. 50 W.	409-444: Gray, vuggy dolostone and limestone, locally sandy or shaley. Some layers of inches-thick greenish silica mud. Rare fossil molds.	Unknown	Devonian(?)
	444-520: Gray, dolostone, locally fossiliferous. Vuggy from 444-472. Cherty from 472-520. Sandy and shaley lenses also present.	Galena Group	Ordovician
	520-530: Sandstone, brown to pink, and sandy dolostone.	Galena Group	Ordovician
	530-646: Gray-green shale with local sandy zones and dolostone layers. Shell fragments concentrated in thin zones.	Galena Group, Decorah Formation	Ordovician
	646-660: Brown dolostone with worm burrows; apparently organic-rich.	Platteville Formation	Ordovician
	660-672: Gray-green shale.	Glenwood Formation	Ordovician
	672-697: Gray, mature, fine-grained quartzose sandstone with thin, pink sandstone lenses and one black organic-rich layer.	St. Peter Sandstone	Ordovician
	697-752: Green-gray shale with dolostone and glauconite sand interbeds.	Davis Formation	Cambrian
	752-794: Brown, gray, and white, well-sorted, fine- to medium-grained quartzose sandstone with minor dolostone lenses. Under artesian conditions.	Wonewoc Sandstone	Cambrian
	794-878: Dolostone and shale with some sandy zones and glauconite sand lenses.	Bonnerterre Formation	Cambrian
	878-897: White, pink, and brownish-gray, fine- to coarse-grained quartzose sandstone. Locally dolomite or pyrite cemented. 897-908: Reddish-brown, sticky mud with crumbly, reddish-brown sand-sized fragments and mica flakes. 908: Metagabbro.	Mt. Simon Sandstone Saprolite Basement rock	Cambrian Cambrian(?) Precambrian

Table 3. Selected drill holes that intersect Paleozoic strata in Union County with abbreviated logs

Time Divisions		Time (yrs)	Iowa Section (Hallberg, 1986)	Hartford section (Boellstorff, 1978)	Hartford section (Steece, 1965)	Clay County (Christensen and Stephens, 1967)	Minnehaha County (Tomhave, 1994)	This study	
(Richmond and Fullerton, 1986)									
Holocene						Nonglacial sediment	Nonglacial sediment	Nonglacial sediment	
Late Pleistocene	Late Wisconsin	10,000	Dows Fm.			Loess	Late Wisconsin till	Loess	
		14,000	loess			Late Wisconsin till		Late Wisconsin till	
	35,000	Yarmouth-Sangamon Paleosol	Yarmouth-Sangamon Paleosol			Loess	Illinoian(?) till	Yarmouth-Sangamon Pale sol(?)	← ?---?---?---?---?---Loess-----↑
	65,000								
79,000									
	Early Wisconsin	132,000							
Late Middle Pleistocene	Illinoian								
		302,000					Illinoian(?) till		
							Yarmouth(?) Paleosol		
Middle Middle Pleistocene	Pre-Illinoian	610,000	A ₁ tills Classic "Kansan"	A ₁ till	Illinoian till	Illinoian till	Pre-Illinoian 3 till	Pre-Illinoian 3 till	
			Pearlette "O" Ash	Pearlette "O" Ash	Hartford Ash	Sappa Fm. silts and clays	Pearlette "O" Ash	Pre-Illinoian 2 till	
			A ₂ tills	A ₂ till	Kansan till	Grand Island sand and gravel	Pre-Illinoian 2 till	Pre-Illinoian 1 till	
			A ₃ till	A ₃ till	Nebraskan till		Pre-Illinoian 1 till	Pre-Illinoian 0(?) till	
Early Middle Pleistocene									
		738,000	Bishop Ash						
		788,000	A ₄ tills						
			B tills						
Early Pleistocene			Pearlette "S" Ash						
		1,270,000	Pearlette "B" Ash						
		1,650,000							
		2,010,000							
Pliocene									
		2,140,000	C tills						
		2,480,000							
								No ash found for stratigraphic marker	
								Western-derived, Newton Hills, Alcester quartz sand. May range in age to Early Middle Pleistocene	

Table 4. Generalized stratigraphy of Pliocene(?) and Pleistocene sediments in Lincoln and Union Counties and comparison with regional stratigraphy