



Base map compiled by Illinois State Geological Survey from digital data provided by the United States Geological Survey. Topography compiled 1959. Planimetry derived from imagery taken 1993. PLSS and survey control current as of 1996.

North American Datum of 1927 (NAD 27) Projection: Transverse Mercator 10,000-foot ticks: Illinois State Plane Coordinate system, east zone (Transverse Mercator) 1,000-meter ticks: Universal Transverse Mercator grid system, zone 16

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SCALE 1:24,000										
1	1/2			0						1 MILE
	1000	0	1000	2000	3000	4000	5000	6000	7000 FEET	
			0			1 KILOMETER				

BASE MAP CONTOUR INTERVAL 10 FEET SUPPLEMENTARY CONTOUR INTERVAL 5 FEET NATIONAL GEODETIC VERTICAL DATUM OF 1929

Released by the authority of the State of Illinois: 2008

Geology based on field work by W.J. Nelson and F.B. Denny, 1995–1996.

Digital cartography by J. Domier, M. Widener, and M. Turino, Illinois State Geological Survey.

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IGQ Brownfield-BG Sheet 1 of 2

SYSTEM	SERIES	FORMATION	MEMBER	GRAPHIC COLUMN	THICKNESS (FEET)	
QUAT. TERT.	PLEIS. PLIO.	Mounds Gravel		0 0 <td< td=""><td>0–80</td><td>)</td></td<>	0–80)
CRETACEOUS	MAASTRICHTIAN	McNairy			0–18	0
			Tygett Sandstone		10	
		Clore	Cora		30–50	4060
		Palestine			50–80	
		Menard Limestone			120–1	40
		Waltersburg			35–8	5
		Vienna Ls.			8–45	5
		Tar Springs			65–130	
		Glen Dean Limestone			40–6	0
	AN	Hardinsburg			70–12	20

A Mounds Gravel Gravel and sand. Gravel is composed of subrounded to well-rounded chert pebbles up to 4 inches in diameter and scattered small white quartz pebbles. The chert pebbles bear a bronze to yellowish brown patina. Sand, which serves as matrix for the gravel and also occurs as lenses and interbeds, is deep red, medium to coarse grained, and generally lacks mica. Gravel and sand are crudely stratified; locally crossbedded. Some beds, particularly at the base of the Mounds, are cemented by iron oxide. Unconformity at base.

B McNairy Sand, silt, and clay. Sand is light gray to medium reddish orange, very fine to fine grained, laminated to thickly bedded, and contains numerous lenses and laminae of clay. Silt and clay are medium to dark gray and commonly contain laminae of sand. Abundant mica is characteristic of the McNairy. Unconformity at base.

C Clore Sandstone, shale, and limestone. The Tygett Sandstone Member at the top is composed of light to medium brownish gray, very fine-grained sandstone that is laminated to thinly bedded and is roughly 10 feet thick. The Cora Member, below the Tygett, is 30 to 50 feet of shale that contains limestone interbeds less than 5 feet thick. The shale is olive-gray to dark gray fissile clay shale; the limestone is medium to dark gray, argillaceous lime mudstone to skeletal wackestone. The Clore Formation is poorly exposed at the northwest corner of the quadrangle; the upper part of the formation is eroded. Descriptions are largely based on outcrops and boreholes in adjacent quadrangles. The lower contact probably is conformable.

D Palestine Sandstone, siltstone, and shale. The lower part is largely sandstone. Some of it is light gray, fine-grained, mediumto thick-bedded, clean quartz arenite. The remainder is brownish gray, very fine-grained, laminated to thinly bedded, shaly to silty sandstone that contains current and interference ripples and (locally) mud cracks. The upper Palestine is not exposed; in adjacent quadrangles it is largely shale and siltstone. Coal and rooted mudstone occur in the upper Palestine in the adjacent Glendale Quadrangle (Devera 1991). The lower contact is not observed.

E Menard Limestone Limestone and shale. The formation is principally limestone with interbeds of shale as thick as 15 feet. The limestone is mostly medium to dark brownish and olive-gray lime mudstone to skeletal wackestone. It commonly weathers bluish gray and lies in hummocky beds 6 to 18 inches thick. Nodules of dark gray chert are present. Coarse crinoidal grainstone and fine-grained oolitic grainstone or packstone with dark gray oolites occur in the upper part of the Menard. The uppermost 10 to 15 feet is dominantly shale that contains large nodules and lenses of orange- to gray-weathering, dolomitic, skeletal wackestone. Brachiopods, bryozoans, and echinoderm fragments are common in the Menard. Shale is dark gray to dark olive-gray and greenish gray, soft, fissile, fossiliferous and calcareous, and clayey to slightly silty. The lower contact is probably conformable and gradational.

downfaulted blocks along Cement Hollow and by well records, is composed of shale, siltstone, and thin-bedded sandstone arranged in upward-fining sequences, some of which are capped by rooted claystone and thin, lenticular coal. The middle and lower Hardinsburg, best exposed along Brownfield Bluff, are light gray very fine- to fine-grained quartz arenites that have mostly tabular cross-bedding less than an inch to about 2 feet thick. Planar and ripple lamination, cross-bedding, small load casts, and slumped lamination are common. Some intervals of sandstone are interlaminated with shale and siltstone. On the western part of Brownfield Bluff, an upper channel sandstone that is mostly thick-bedded to massive cuts downward with an erosional contact. In places this sandstone has a basal lag of shale and sandstone pebbles, coal lenses and stringers, and casts of fossil tree trunks including *Lepidodendron*.

K Haney Limestone Limestone, shale, and minor dolomite. Core drilling indicates 2 to 10 feet of limestone at the top, overlying 25 to 30 feet of shale, and then 30 feet of limestone. The upper limestone does not crop out. The middle shale is dark gray to olive-gray, with thin reddish brown layers. It is fissile and slightly silty; near the base it is calcareous, grading into the lower limestone. Most outcrops of the Haney represent the lower limestone, which varies from medium dark gray, argillaceous lime mudstone and skeletal wackestone to lighter gray skeletal and oolitic packstone and grainstone. Bioclasts are dominantly echinoderms, bryozoans, and brachiopods. Beds of brownish gray, microgranular dolomite are present near the top. The lower limestone contains laminae and interbeds of dark gray to olive-gray fissile shale. The lower contact is sharp in some places, gradational in others.

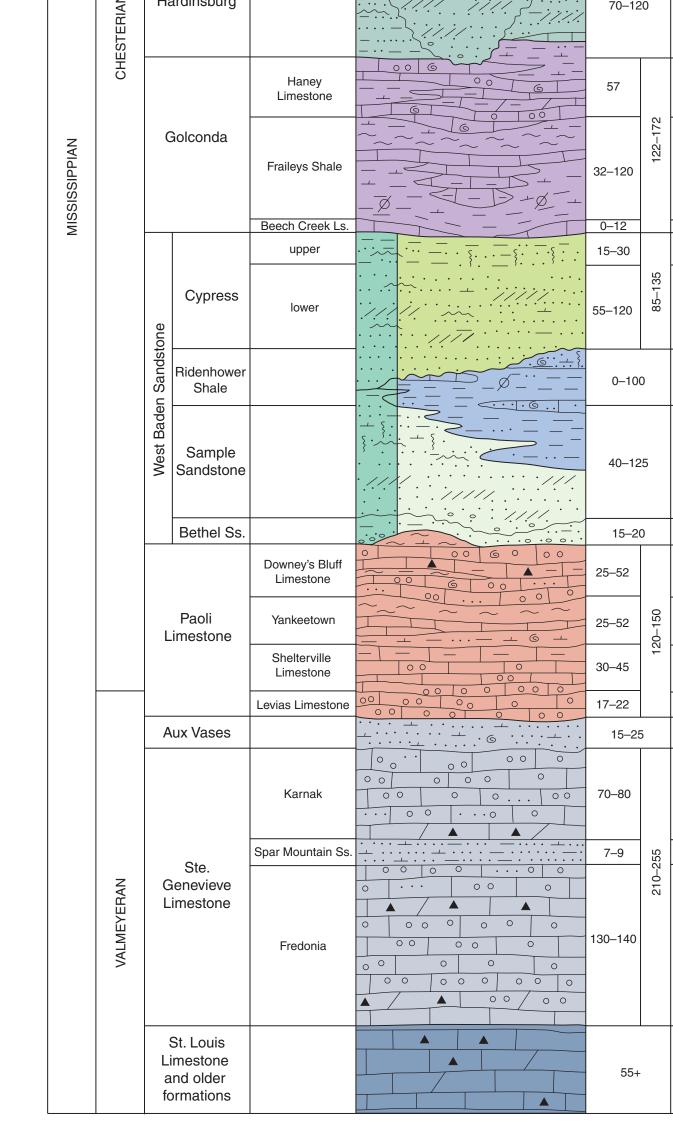
L Fraileys Shale Shale, limestone, and mudstone. The topmost unit, not everywhere present, is dark gray to greenish gray fissile, calcareous clay shale 10 to 15 feet thick. This shale overlies 2 to 10 feet of variegated (red, purple, green, and gray), partly calcareous blocky mudstone, grading downward to variegated fissile shale. Next below is limestone that is generally less than 10 feet thick, but in the Trovillion borehole (SW¹/₄, SE¹/₄, Sec. 31, T13S, R6E), limestone thickens to 45 feet at the expense of the underlying shale. The limestone is coarse, highly fossiliferous crinoid-bryozoan packstone and grainstone. Where the limestone is thick, the lower part grades to skeletal wackestone and lime mudstone with numerous shale interbeds. The lower part of the Fraileys is 10 to 50 feet of clay shale that is dark gray and greenish gray, fissile, and calcareous and contains siderite nodules. The basal contact is sharp; one core description reported a basal conglomerate.

M Beech Creek Limestone Limestone. Dark brownish gray, shaly to sandy. Varies from dolomitic lime mudstone to argillaceous crinoidal wackestone and packstone to medium-grained crinoidal packstone with brachiopods. Only one small outcrop of the Beech Creek was found; the description is based mainly on cores and well cuttings. The lower contact is sharp and conformable. **Q** Sample Sandstone Sandstone. Sandstone is white to light gray quartz arenite that forms an upward-fining sequence. The upper part is very fine to fine grained, laminated to thinly bedded, and exhibits planar to wavy lamination, ripple marks, and crosslamination. Horizontal burrows are present, and some of the sandstone is calcareous. The lower part of the Sample is medium to coarse grained with a sugary texture. Small quartz granules occur near the base. Some bedding is lenticular; other outcrops show planar cross-bedding that dips west or southwest. The lower contact is erosional, truncating bedding of the underlying unit, and featuring a lag deposit of shale, chert, coal, and limestone pebbles and casts of fossil logs. This erosional contact is exposed at Ropers Landing and on the bluff southwest of Lackev Bridge (NW Sec. 26, T14S, R6E), and in the core from the Abner Field No. 1 borehole (Sec. 19, T13S, R6E). This contact is the key to recognizing that most of the sandstone previously called Bethel in this area actually is the Sample. However, the Sample and Bethel Sandstones were combined on the geologic map because in most places exposures are too spotty to differentiate the two sandstones.

R Bethel Sandstone Sandstone, siltstone, and shale. Sandstone is white to light gray, very fine- to fine-grained, rarely medium-grained quartz arenite. The Bethel sandstone is interlaminated and thinly interbedded with gray to greenish gray shale and siltstone. Ripple lamination and ripple cross-lamination are common, along with planar cross-bedding and herringbone cross-bedding that dip northeast and northwest. The lower contact is erosional and is marked by a basal conglomerate in the one good exposure found: the bluff just west of Lackey Bridge.

S Downey's Bluff Limestone Limestone and shale. In the Abner Field core, the uppermost 18 feet consists of shale that is greenish gray with red mottling and is calcareous. The shale is loaded with bryozoans and echinoderm fragments. The shale does not crop out. The rest of the Downeys Bluff is dominantly limestone. The upper part is light to medium gray and brownish gray, medium- to coarse-grained oolitic and skeletal (largely crinoidal) grainstone and packstone. Scattered orange echinoderm fragments are distinctive for this unit. The middle part is generally dark, somewhat argillaceous and cherty skeletal packstone and wackestone. Beds range from a few inches to 2 feet thick and are separated by wavy argillaceous partings. The lower Downeys Bluff consists of somewhat sandy, fine-grained, and well-sorted crinoidal and oolitic grainstone. Interbeds of greenish gray to reddish gray, mottled, soft blocky claystone and fissile shale occur in the Downeys Bluff. The lower contact is sharp but probably conformable.

T Yankeetown Shale, limestone, and claystone. Red, greenish gray, and gray mottled and variegated shale and claystone occur



F Waltersburg Shale, siltstone, and sandstone. A shale-dominated, upward-coarsening succession is indicated in the Waltersburg. Dark gray to dark olive-gray, fissile, sideritic clay shale at the base grades upward to silty shale, then siltstone. Sandstone near the top is very fine grained, argillaceous, and calcareous. The lower contact appears to be gradational.

G Vienna Limestone Limestone and shale. Limestone is mostly medium to dark brownish gray, argillaceous lime mudstone and skeletal wackestone. A little light gray crinoidal grainstone also is present. Dark gray calcareous shale at the top grades into the overlying unit. The lower contact of the Vienna Limestone is sharp but probably conformable.

H Tar Springs Sandstone, siltstone, and shale. Sandstone is quartz arenite that is white to light gray and very fine to fine grained. Most of it is thin- to medium-bedded; ripple marks and planar and trough cross-bedding are well developed. Gray shale and siltstone occur as thin interbeds, laminae, and rip-up clasts. Along Rocky Branch north of Rt. 146, thick-bedded sandstone rests with the erosional contact on thin- to medium-bedded sandstone. The uppermost part of the Tar Springs does not crop out; well records indicate 10 to 20 feet of gray siltstone and silty shale containing thin interbeds of sandstone. The lower contact is erosional, truncating the upper limestone bench of the Glen Dean in the northern part of the quadrangle. In the southeast corner of the quadrangle, however, the lower contact is gradational and intertongues on a small scale.

I Glen Dean Limestone Limestone and shale. The full succession of Glen Dean comprises an upper limestone, an upper shale, a lower limestone, and a lower shale. The upper limestone is known only from well records, being eroded beneath the Tar Springs on the outcrop. It consists of skeletal wackestone in the lower part and crinoidal and oolitic packstone and grainstone at the top; maximum thickness is 15 feet. The upper shale, about 15 feet thick, is dark gray to olive or greenish gray, soft and fissile, calcareous clay shale. Bryozoans, brachiopods, and echinoderm fragments are abundant; lenses and thin interbeds of fossiliferous limestone are present. The lower limestone, 10 to 30 feet thick, has 1 to 5 feet of coarse crinoidal grainstone and packstone at the top. The remainder of the lower unit is an unusual lithology for the Glen Dean: dark gray to nearly black, argillaceous lime mudstone that contains numerous thin interbeds of hard, calcareous, dark gray shale. This dark rock contains a sparse fauna of derbyid and spiriferid brachiopods, echinoderm fragments, and conularia. The lower shale unit is similar to the upper shale but becomes silty toward the base, grading into the underlying formation.

J Hardinsburg Sandstone, siltstone, shale, thin coal, and claystone. The upper 20 to 30 feet, as shown by outcrops in

N Cypress upper Mudstone, shale, siltstone, and thin-bedded sandstone. Thin shale at the top is soft, fissile, and greenish gray. The remainder is variable, fine clastics. Cores in Sec. 8, T14S, R6E show dark greenish gray shale and mudstone with maroon streaks and lenses and laminae of sandstone. Elsewhere, medium to dark gray silty shale and siltstone are interbedded with light gray, very fine- to fine-grained sandstone. Sandstone along Miller Creek has flaggy bedding, fine planar laminations, and parting lineations that strike west-northwest to east-southeast. Elsewhere the sandstone is generally ripple-laminated to thinly bedded. Some layers are burrowed; trace fossils include *Planolites, Lockeia*, and a teardrop-shaped trace interpreted as the resting trace of a shrimp (Joseph A. Devera, personal communication, 1996). The lower contact of the upper Cypress is gradational.

O Cypress lower Sandstone; minor shale and siltstone. Sandstone, which forms ledges and small cliffs, is white to light gray, very fine- to fine-grained quartz arenite. In well samples, some of the sandstone is calcareous. In outcrops, most sandstone is thinto medium-bedded, exhibiting ripple marks, flaser bedding, and planar lamination. Thick-bedded sandstone occurs commonly at the base of the lower Cypress and, less commonly, higher in the formation. This sandstone has irregular, lenticular bedding and commonly is cross-bedded. Siltstone and silty shale are light gray to greenish gray, commonly ripple laminated, and contain balland-pillow structures. Siltstone and shale occur as laminae and interbeds up to a few feet thick. The lower contact is erosional and may have several tens of feet of relief.

P Ridenhower Shale Shale, siltstone, sandstone, and limestone. The uppermost unit, commonly eroded beneath the Cypress Formation, is up to 15 feet of very fine-grained, shaly sandstone that is irregularly laminated and burrowed. This sandstone is calcareous and contains crinoid and bryozoan fragments. Beneath the sandstone is as much as 45 feet of dark gray, fissile clay shale to slightly silty shale that contains siderite nodules. Next lower is 5 to 10 feet of sandy limestone to calcareous sandstone, generally dark gray skeletal wackestone that contains echinoderms, bryozoans, rugose corals, brachiopods, and goniatite cephalopods. The basal unit, as thick as 30 feet, is dark greenish gray, noncalcareous fissile clay shale, which grades laterally to silty shale, siltstone, and shaly sandstone of the upper part of the Sample Sandstone. Toward the west and northwest, the upper part of the Ridenhower is progressively eroded beneath the Cypress, and the lower part grades to sandstone. The Ridenhower previously was called Paint Creek Formation (Weller and Krey 1939, Amos 1966). In areas where the Ridenhower is absent or not recognized, the undivided Cypress, Sample, and Bethel Sandstones are mapped as a single unit, the West Baden Sandstone.

at the top. These rocks are calcareous and fossiliferous and contain limestone lenses. The multicolored unit is 5 to 11 feet thick. Below this is 10 to 20 feet of limestone with thin shale interbeds. Limestone is light to medium brownish gray skeletal and oolitic grainstone, packstone, and wackestone. The lower part of the Yankeetown is 10 to 15 feet of greenish gray to nearly black, fissile calcareous shale, the upper part of which is silty and very fossiliferous. The lower contact is gradational.

U Shelterville Limestone Limestone and shale. Argillaceous lime mudstone and skeletal wackestone in the upper part grade downward to crinoidal and oolitic packstone and grainstone. All of these Shelterville Limestone rocks are medium to dark brownish gray. Interbeds of dark gray to black, fissile shale as thick as 10 feet occur in middle and upper portion. The lower contact is an unconformity with little relief.

V Levias Limestone Limestone. The white to light gray skeletal and oolitic grainstone contains occasional red or pink oolites. The core from the Abner Field borehole shows a breccia of limestone fragments in a shale matrix at the top of the Levias. The lower contact is gradational in the Abner Field core.

W Aux Vases Sandstone, siltstone, and limestone. Siltstone and very fine sandstone are light gray to greenish gray with some red mottling in siltstone at the top of the unit. These Aux Vases rocks are calcareous and glauconitic and intergrade with silty to sandy limestone. The lower contact is gradational.

X Karnak Limestone. Light to medium gray and brownish gray oolitic and crinoidal grainstone with interbeds of lime mudstone and dolomitized, obscurely granular limestone. Sandy limestone beds occur near the top of the Karnak. Laminae and interbeds up to several feet thick of greenish gray to dark gray shale are present.

Y Spar Mountain Sandstone Siltstone. Medium to dark gray calcareous Spar Mountain siltstone is laminated and intergrades with silty shale and very fine-grained sandstone.

Z Fredonia Limestone. Similar to the Karnak Member but generally lacks shale and sandy limestone. Intervals of micritic, cherty limestone similar to the underlying St. Louis range up to about 10 feet thick, but the Fredonia is mostly light-colored oolitic and skeletal packstone to grainstone.

AA St. Louis Limestone and older formations Limestone. Light to dark gray and brownish gray lime mudstone and fineto medium-grained, partially dolomitized skeletal wackestone and packstone. Oolites are uncommon. Limestone commonly is cherty. Deepest well penetration within the quadrangle is about 55 feet into this unit.

Note: See accompanying report for References section.

