

Department of Natural Resources Brent Manning, Director

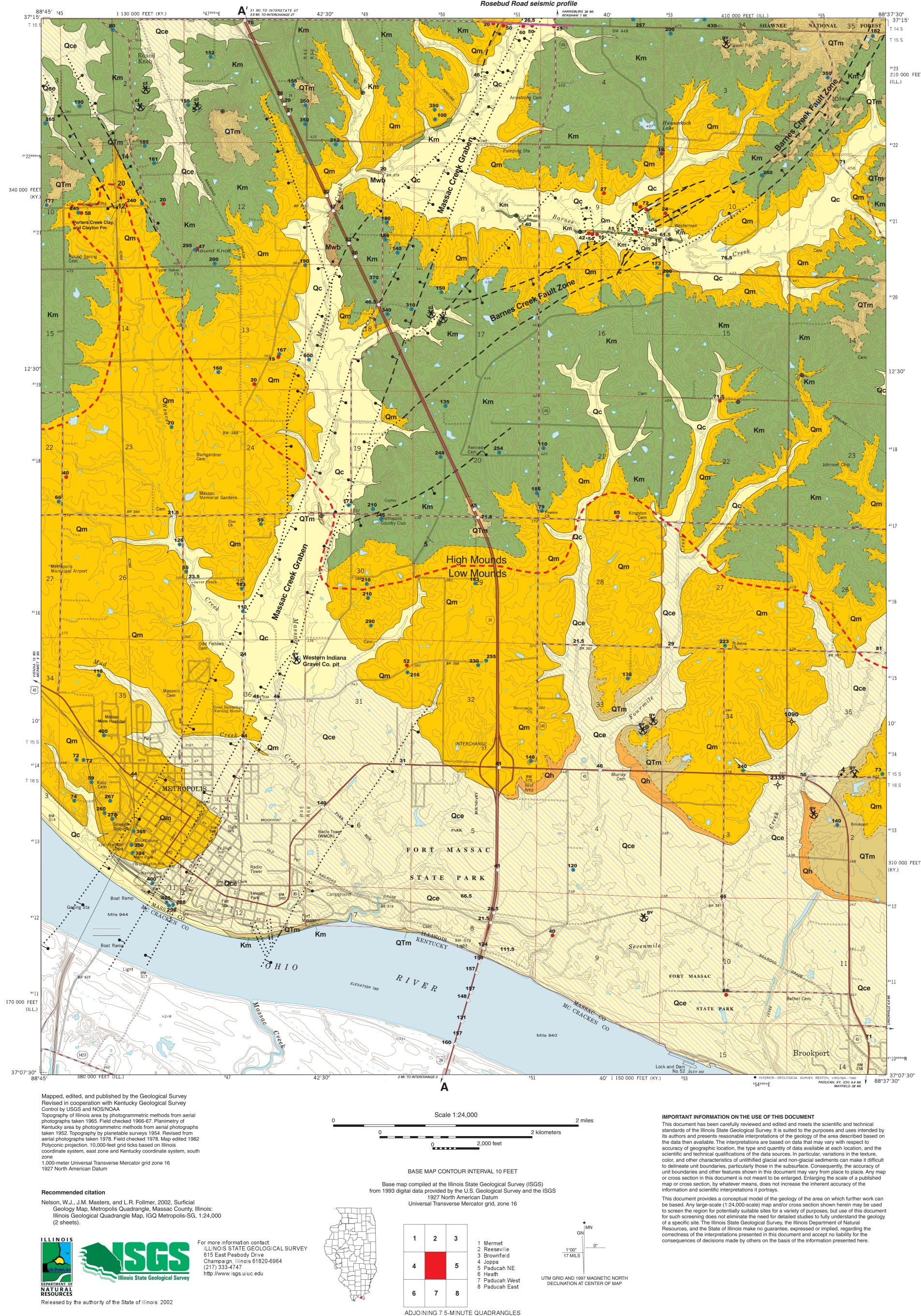
ILLINOIS STATE GEOLOGICAL SURVEY William W. Shilts, Chief

Illinois Geologic Quadrangle Map: IGQ Metropolis-SG, sheet 1 of 2

# **SURFICIAL GEOLOGY** Metropolis Quadrangle,

Massac County, Illinois

W. John Nelson, John M. Masters, and Leon R. Follmer



SYSTEM		SERIES and STAGE	FORMATION	MEMBER	GRAPHIC COLUMN	THICKNESS (feet)	UNIT
ARY		OlOCENE Wisconsinan	Cahokia Equality			0-32 0-350-20 2-4	A BC E F
QUATERNARY	Pleistocene	Illinoian Pre- Illinoian	Metropolis			0-80	G
TERT- IARY		Pliocene Miocene	Mounds Gravel			0–55	н
I AF		aleocene	Porters Creek Clay Clayton Fm.			4.5	I
CRETACEOUS	Upper	Maastrichtian	McNairy			0–200	J
		Campanian	Post Creek				
				Haney Ls.		0–60	К
			Golconda	Fraileys Sh.		125–170	L
		Chesterian	West Baden Ss.	Beech Creek Ls.		200–250	М
MISSISSIPPIAN			Paoli Ls.	Downeys Bluff Ls. Yankeetown Shetlerville Ls. Levias Ls.		115–150	N
2			Aux Vases			15–25	0
			Ste. Gene- vieve Ls.			200–250	Р
			St. Louis Ls.			280–350	Q
			Salem Ls.			320–365	R
	Va	lmeyeran	Ullin Ls.			135	S
			Fort Payne			500+	т

Note: Some Mississippian units are not drawn to scale.

Qc	Cahokia Formation
Qce	Cahokia and Equality Formations
Qh	Henry Formation
Qm	Metropolis Formation
QTm	Mounds Gravel
Km	McNairy Formation
Mwb	West Baden Sandstone

### Loess deposits, comprising the Peoria, Roxana, and Loveland Silts, cover nearly all upland areas of the Metropolis Quadrangle. These units are not shown on the geologic map.

### Line Symbols Lines are dashed where inferred, dotted where concealed

	Contact ( <i>Highly inferential contacts are "scratch"; that is, no line is used</i> )
• •	Fault; ball and bar on downthrown side
	Boundary between "high Mounds Gravel" and "low Mounds Gravel"
<u>A A</u> '	Line of cross section (Note that Section A-A' follows Interstate Rt. 24)
	Seismic profile

## **Symbols**

30	Strike and dip of bedding; number indicates degree of dip
⊕	Horizontal bedding
X	Vertical joints or fractures
$\mathbf{X}$	Active pit, gv = gravel
X	Abandoned pit, cl = clay, gv = gravel
-	

### **Drill Holes from Which Subsurface Data** Were Obtained

<ul> <li><sup>70</sup></li> </ul>	Water well, with depth in fee
⊙ <sup>56</sup>	Engineering boring, with depth in feet
<b>20</b>	ISGS stratigraphic test bori with depth in feet
2335 -¢-	Dry oil-test hole with depth in feet
	Primary highway
	Secondary highway
	Light duty road
	Unimproved; four-wheel drive
	Railroad

## UNIT DESCRIPTIONS

A Cahokia Formation. Clay, silt, sand, and gravel. Largely brownish gray, mottled silty clay and clayey silt that is massive to indistinctly bedded and contains lenses of sand and gravel. Gravel consists dominantly of chert pebbles that are derived from Mounds Gravel but are bleached, worn, and pitted. Well-preserved plant matter is common. Clean sand and minor gravel are present in the modern Ohio River channel. The Cahokia comprises alluvial deposits on modern flood plains. The lower contact is gradational and difficult to identify where this unit rests on the Equality Formation. Elsewhere, the lower contact is erosional. **B** Equality Formation. *Clay, silt, sand, and gravel.* Dominantly brownish to bluish gray, stiff to plastic, massive to laminated clay,

silty clay, and clayey silt. Well-preserved plant matter is common. Lenses of sand and gravel are present, mainly in the lower part of the unit. Where it borders the Ohio River, the Equality Formation represents deposits of Lake Paducah, a lake that existed in what is now the Ohio Valley during the Wisconsinan age (Finch et al. 1964, Olive 1966). Equality Formation in the two northwest-trending valleys at the northwest corner of the quadrangle is interpreted as slackwater or overbank deposits in tributaries to the Cache Valley, which carried the flow of the Ohio River and probably the Tennessee and Cumberland Rivers during the late Pleistocene (Masters and Reinertsen 1987, Esling et al. 1989). Lower contact is erosional. C Henry Formation. Sand and gravel. Sand is fine to coarse, composed largely of well-rounded quartz grains with abundant mica. Gravel consists primarily of well-rounded chert pebbles that range up to 3 inches in diameter. Chert pebbles are white to gray, black, and red; many of them bear a worn brown patina and were derived from the older Mounds Gravel. The Henry Formation forms low. linear to arcuate ridges at the border of the Ohio River flood plain in the southeastern part of the map area. These ridges are interpreted as bars or beach ridges that formed along the shoreline of glacial Lake Paducah (Finch et al. 1964). The ridges are mantled by the Peoria Silt, and the Henry Formation is not currently exposed within

the basis of geomorphology, and the description is based on exposures in the adjacent Paducah Northeast Quadrangle. **D** Peoria Silt. Silt is mottled yellowish gray to yellowish brown, massive, and contains small pellets and crack-fillings of iron and manganese oxide. The Peoria is loess: silt that was deposited by the wind near the end of the Wisconsin glaciation, about 10,000 to

15,000 years ago. Nearly all upland surfaces are mantled in Peoria Silt, and the modern soil is developed in the upper part. The lower contact is gradational. Not mapped. E Roxana Silt. Silt is medium brown, commonly with a reddish cast, and may be faintly mottled. It is massive and contains a little

more clay than the Peoria. The Roxana is loess: silt that was deposited by the wind during the middle part of the Wisconsin glaciation, about 20,000 to 25,000 years ago. The Roxana underlies Peoria Silt in uplands, and the Farmdale Geosol, a buried soil, commonly is developed in the Roxana. The lower contact is gradational. Not mapped.

F Loveland Silt. Silt is strongly mottled in vellow, orange, and gray; it is massive to blocky and commonly sandy, especially near the base. The Loveland is clay-rich and contains clay-filled fractures and cavities. The Loveland is loess: silt that was deposited by the wind during the late Illinois glaciation. The Sangamon Geosol, a thick and strongly developed ancient soil, is developed in the Loveland. This unit is lenticular, but found in uplands throughout the quadrangle. The lower contact to Metropolis is gradational, but sharp to older units. Not mapped. **G** Metropolis Formation. *Silt, sand, clay, and gravel.* Dominantly

a diamicton composed of silty sand and sandy silt, having a clay matrix and containing scattered chert and guartz pebbles and lenses of clean sand and gravel. Colors are strongly mottled in brownish gray, yellowish brown, yellowish orange, and locally bright red to orange. Bedding is absent to weakly developed. The sediments are deeply weathered, thoroughly burrowed, and contain multiple buried soil horizons. Chert pebbles are reworked from the Mounds Gravel. Some pebbles exhibit a worn brown or bronze patina, but most are bleached and pitted. The Metropolis contains multiple sequences that grade from gravel at the base to silt at the top. This formation was named by Nelson et al. (1998) and is interpreted as fluvial sediments that occupied an underfit valley ancestral to the modern Ohio. Streams that deposited the Metropolis evidently were small and sluggish; the sediment was subjected to long periods of weathering and soil formation. The Metropolis Formation underlies a subtle terrace that was named Metropolis terrace by Alexander and Prior (1968). The upper surface of the Metropolis terrace stands near earlier?) time. the 400-foot elevation contour near the Ohio River. The terrace surface rises gradually up the valleys of Massac and Barnes Creeks. Overlying the Metropolis on the terrace is the Loveland Silt, a loess deposit of Illinoian age. South of the "low Mounds-high Mounds"

boundary marked on the geologic map, the Metropolis overlies the

Mounds Gravel with a gradational contact. North of that boundary, the Metropolis unconformably overlies the McNairy Formation or, locally, Mississippian sandstone.

H Mounds Gravel. Gravel and sand. Principally gravel that is composed of chert pebbles ranging up to about 4 inches in diameter and lesser quantities of quartz pebbles up to 0.5 inch across. Chert pebbles are sub-rounded to well rounded and bear a glossy yellowish brown to bronze patina of iron oxide. Quartz pebbles tend to be well rounded. The matrix is largely reddish brown to reddish orange, coarse, poorly sorted sand composed mainly of quartz grains. Gravel is crudely layered or cross-bedded and contains lenses of sand. In the northern part of the quadrangle, the Mounds Gravel caps hills at elevations of 450 feet or higher. In the southern part of the map area, the Mounds underlies the Metropolis Formation at elevations below 380 feet. The boundary between "high Mounds" and "low Mounds" is marked on the geologic map. The Mounds is interpreted as deposits of large, braided rivers that were at least partly ancestral to the modern Tennessee River (Potter 1955, Olive 1980, Nelson et al. 1999). The "high Mounds" represents

an older stage of river deposition, and the "low Mounds" represents a younger, more deeply incised stage, in a valley subsequently occupied by the modern lower Tennessee and Ohio Rivers. When Mounds deposition ended (early Pleistocene), the Tennessee and Cumberland Rivers flowed north through Smithland Gap and joined the Ohio River in the Cache Valley (Nelson et al. 1999). The Mounds Gravel is equivalent to "continental deposits" of western Kentucky and to the Lafayette Gravel of Tennessee. The lower contact is

I Porters Creek and Clayton Formations. Clay and sandy clay. A single outcrop, too small to show at the scale of the map, was found in a gully on the east side of the Illinois Central Railroad just north of Seilbeck Road (location arrow near center, Sec. 11, T15S, R4E). Two feet of light olive-gray, silty, stiff, weakly laminated clay that weathers yellowish orange is identified as Porters Creek. Below the clay, hand the Metropolis Quadrangle. The Henry Formation is mapped here on augering revealed 2.5 feet of olive to greenish gray, sandy clay that is blocky to weakly laminated and contains abundant glauconite. This lithology is diagnostic for the Clayton Formation. The Clayton in turn overlies micaceous sand of the McNairy Formation. The Porters Creek and Clayton are marine sediments of Paleocene (early Tertiary) age. They are widespread south of the map area, but elsewhere in the Metropolis Quadrangle, they were eroded prior to deposition of the Mounds Gravel. Their presence here, underlying exposures of Metropolis Formation that are tilted and cut by small faults, signifies that a fault block was lowered and protected from

erosion during the Tertiary Period. J McNairy Formation. Sand, silt, and clay. Sand is mostly light gray to yellowish and brownish gray in well samples, but in outcrops it is brightly colored in red, orange, and yellow. It is very fine- to finegrained, less commonly medium- to coarse-grained, and composed mostly of quartz, but contains abundant fine mica flakes. Some sand is cross-bedded; some has ripple and planar lamination. Laminae and rip-up clasts (clay galls) of light gray clay are common. Lenses of white, well-sorted, pure quartz sand similar to the "Commerce quartzite" of southeastern Missouri are present. Silt and clay vary from medium to dark gray, brownish, and bluish gray and may be massive or blocky to thinly laminated. Clay, silt, and sand commonly are interlaminated, lending a striped appearance to outcrops and cores. Clay and silt intervals contain lenses, bands, and concretions of limonitic ironstone. No fossils other than burrows and other indistinct traces were found. The McNairy is interpreted as delta and shoreline deposits of the Mississippi Embayment, an arm of the Gulf of Mexico that extended as far north as southern Illinois near the end of the Cretaceous Period (Potter and Pryor 1961). The McNairy rests either on the Post Creek Formation with a gradational contact or on bedrock with an erosional contact.

K Post Creek Formation. Gravel, sand, and clay. This unit is largely gravel composed of sub-rounded to well-rounded chert pebbles that are white to light gray, opaque, slightly porous, and partly tripolitic. Less common are medium- to dark brown chert pebbles and well-rounded small white quartz pebbles and granules. The matrix is fine to very coarse, unsorted quartz sand in which the finer grains are sub-rounded and the larger ones well rounded. Sand is intermixed with dark gray, pyritic silt and clay. Previously called the

Tuscaloosa Formation, the Post Creek was named by Harrison and Litwin (1997) for exposures along Post Creek Cutoff in eastern Pulaski County. The Post Creek does not crop out in the Metropolis Quadrangle; its description is based on samples from wells. This unit commonly overlies a rubble zone of chert fragments derived from prolonged weathering of cherty limestone during Cretaceous (and

L Golconda Formation. Limestone and shale. Drillers' logs of water wells indicate limestone interbedded with gray to green shale. More detailed well records and outcrops in adjacent quadrangles show the Golconda is divisible into three units: (1) the Haney

Metropolis Quadrangle: List of wells from which geologic information was obtained.

Number <sup>1</sup>	Operator	Farm or Road	Type of Well	Location	Section	n T.D. <sup>2</sup>	Formation at T.D. <sup>3</sup>	Type of Log(s)	Number <sup>1</sup>	Operator	Farm or Road	Type of Well	Location	Sectio	n T.D. <sup>2</sup>	Formation at T.D. <sup>3</sup>	Type of Log(s)
	-									•							
				T14S, R5E									T15S, R5E				
20381	Paul Horman	Chris Markus	water	400' SL, 1700' EL	33	257'	Ste. Genevieve Ls.	drillers	20870	ISGS	Westerman #BC-6	stratigraphic	2400' SL, 40' WL	10	24'	McNairy	sample study by auti
20624	R. Beanland	Steve Parks	water	450' SL, 1500' WL	34	430'	St. Louis Ls.	drillers	3079	IDOT R. Beanland	Midway Road	bridge boring	500' SL, 2700' EL	10 10	76.5'	McNairy West Baden Ss.	engineers
				T15S, R4E					20405 3012	IDOT	Dewey Hudson Crestwood Road	water	950' NL, 1200' EL	11	260' 71'	McNairy	drillers
				,					20688	Paul Horman	Ronnie Koch	bridge boring water	500' NL, 2300' WL 200' NL, 150' WL	15	200'	Mississippian Ls.	engineers drillers
22	IDOT	Rosebud Road	· ·	0' NL, 2600' WL	1	76'	Mississippian Ss.	engineers	20000	R. Beanland	Mary Oliver	water	1150' NL, 1200' WL		200 150'	Post Creek	drillers
2E	IDOT	Interstate 24	engineering	1950' SL, 1120' EL	1	26'	McNairy	engineers	0025	IDOT	Interstate 24	bridge boring		18	46.5	McNairy	engineers
3E	IDOT	Interstate 24	engineering	1670' SL, 1020' EL	1	20'	McNairy	engineers	20461	R. Beanland	Dale Story	water	600' NL, 1600' EL	18	370'	West Baden Ss.	drillers
3.5E	IDOT	Interstate 24	engineering	1220' SL, 810' EL	1	21'	McNairy	engineers	20407	R. Beanland	Phil Arensman	water	1250' SL, 50' WL	18	600'	Paoli Ls.	drillers
20463	Paul Horman	Wilson Kruger	water	1600' NL, 1000' WL	1	152'	Mississippian Ss.	drillers	20633	R. Beanland	Kelly Glass	water	1900' NL, 100' EL	18	310'	chert	drillers
20337	J. Beanland	Leroy Kommer	water	1700' SL, 0' EL	1	350'	West Baden Ss.	drillers	20649	R. Beanland	Dwight Atkison	water	2000' NL, 1200' EL	18	340'	West Baden Ss.	drillers
20558	Paul Horman	Thomas Bunting	water	750' SL, 100' EL	1	350'	West Baden Ss.	drillers	20568	R. Beanland	Mike King	water	300' SL, 1800' WL	19	172'	Post Creek	drillers
20386 20299	R. Beanland	Wayne Bunting	water	2400' SL, 700' EL	1	205' 155'	West Baden Ss.	drillers drillers	20409	R. Beanland	Howard Windhorst	water	250' SL, 1750' EL	19	210'	Mississippian Ls.	drillers
20299 3092	Paul Horman IDOT	Jerry Baird New Columbia Road	water	1600' SL, 150' WL	2	155 80'	Mississippian Ss.		0027	IDOT	Interstate 24	bridge boring	0' SL, 2640' EL	20	71.5	McNairy	engineers
20643	R. Beanland	Lyndell Ramsey	water water	450' NL, 2200' WL 1700' SL, 750' WL	2	190'	Post Creek Mississippian Ls.	engineers drillers	1S	IDOT	Interstate 24	engineering	150' SL, 2740' EL	20	45'	McNairy	engineers
20683	R. Beanland	Vernon Buldtman	water	1000' SL, 700' EL	3	265'	Mississippian Ls.	drillers	177	W.E. Sergent	Floyd Cougill	water	2500' SL, 1150' WL	20	248'	"broken rock"	drillers
165	Paul Horman	Paul Vogt	water	2400' NL, 800' EL	10	177'	McNairy	drillers	20203	S. Cunningham	Lewis Johnson	water	NE SE SE	20	185'	Post Creek	drillers
20628	L. Beanland	Larry Keller	water	2500' NL, 1850' EL	11	240'	Mississippian Ls.	drillers	20849	Paul Wittig	Middagh	water	750' NL, 1300' WL	20	135'	McNairy	sample study by auth
20223	Paul Horman	William Comer	water	100' NL, 1750' EL	11	185'	Post Creek	drillers	20634	L. Beanland	Hunter Kreuter	water	2500' NL, 1700' EL	20	254'	Mississippian Ls.	drillers
20340	Paul Horman	Dr. Robert Bryan	water	850' NL, 1300' EL	11	181'	Post Creek	drillers	20909	ISGS	Copley	stratigraphic	180' SL, 1950' EL	21	85'	McNairy	sample study by auth
113	Paul Horman	LaVerne Buldtman	water	2400' SL, 600' WL	11	245'	McNairy	drillers	20848	Paul Wittig	C. & D. Krueger	water	2300' NL, 150' WL	21	110'	McNairy	sample study by auth
20921	ISGS	Norwood	stratigraphic	2450' SL, 700' WL	11	58'	Mounds Gravel	sample study by author	8	Paul Wittig	Paul Sheppard	water	350' SL, 150' WL	21	79'	McNairy	sample study by auth
20886	ISGS	Wiseman	stratigraphic	2600' NL, 800' EL	11	20'	McNairy	sample study by author	20244	ISGS		stratigraphic	100' NL, 2400' WL	22	71.5'	McNairy	sample study by auth
166	Paul Horman	John Swenney	water	200' SL, 1300' WL	12	200'	Mississippian Ls.	drillers	3110	IDOT	Waldo Church Road	bridge boring	,	26	81'	McNairy	engineer
72	Quentin Richey	Roy Hinners	water	700' SL, 550' WL	12	295'	Golconda	drillers	13	Metrop. Well Co.		water	70' SL, 2700' WL	27	223'	McNairy	driller
20920	ISGS	Casper	stratigraphic	750' SL, 650' WL	12	47'	McNairy	sample study by author	3044	IDOT	Waldo Church Road	water	0' SL, 1750' WL	28	21.5'	Mounds Gravel	engineer
20242	Quentin Richey	Frank Forthman	water	60' SL, 60' EL	12	190'	Mississippian Ls.	drillers	62	S. Cunningham	Powers School	water	2500' SL, 2500' WL		183'	Post Creek	sample study by Coc
20302	Paul Horman	J. Brenningmeyer	water	800' SL, 1500' WL	13	160'	Mississippian Ls.	drillers	21	Paul Wittig	Metropolis C.C.	water	150' NL, 1420' EL	30	345'	Salem Ls.	sample study by auth
20552	R. Beanland	Phil Arensman	water	1500' SL, 1200' EL	13	167'	West Baden Ss.	drillers	20534	R. Beanland	Robert Mizell	water	2400' SL, 2050' EL	30	210'	Post Creek	drillers
20903	ISGS	Loverkamp #1	stratigraphic	1350' SL, 1250' EL	13	19'	Metropolis	sample study by author	20535	R. Beanland	Jerry Powell	water	1800' SL, 2000' EL	30	210'	Post Creek	drillers
20904	ISGS	Odress Sommers	stratigraphic	350' SL, 2100' EL	13	20'	Metropolis	sample study by author	20651	R. Beanland	Brian Lillie	water	500' SL, 1900' EL	30	290'	Mississippian Ls.	drillers
20562	R. Beanland	Bradley Rehlmeyer	water	550' SL, 150' EL	22	66'	Mounds Gravel	drillers	0012	IDOT	U.S. Rt. 45	bridge boring		31	31'	Mounds Gravel	engineers
20908	ISGS	Eickholz	stratigraphic	1650' SL, 200' WL	23	40'	Metropolis	sample study by author	20881	ISGS	George Gurley	stratigraphic	1100' NL, 350' EL	31	52'	McNairy	sample study by auth
20647	R. Beanland	Orville Bailey	water	1500' NL, 550' EL	23	70'	Mounds Gravel	drillers	63	S. Cunningham	0 ,	water	1350' NL, 300' EL	31	216'	chert	sample study by Coc
3075	IDOT	Korte Road	bridge boring	2550' SL, 350' WL	25	23.5'	Mounds Gravel	engineers	0029	IDOT	Interstate 24	bridge boring		32	41'	Mounds Gravel	engineers
114	James Jennings		water	2400' NL, 100' WL	25	55'	Mounds Gravel	drillers	64	S. Cunningham		water	670' NL, 2190' EL	32	255'	Post Creek?	sample study by Coc
20529	Paul Horman	Walter Korte	water	400' NL, 1950' EL	25	59'	Mounds Gravel	drillers	65	James Jennings		water	300' SL, 300' EL	32	148'	McNairy	drillers
20205	Paul Horman	Ronnie Grimes	water	2200' SL, 2500' WL	25	163'	McNairy	drillers	0005	Layne-Western		water test	1050' NL, 2600' EL	32	230'	Mississippian Ls.	drillers
20448	Paul Horman	Sam Roberts	water	1200' SL, 2550' WL		110'	McNairy	drillers	0005	IDOT Devil Harmon	U.S. Rt. 45	bridge boring	0' SL, 2700' EL	33	46'	Mounds Gravel	engineers
202	Paul Horman	Harold Lovelace	water	1200' NL, 100' EL	26	126'	McNairy	drillers	20206 3084	Paul Horman IDOT	Ramus Cummins Waldo Church Road	water bridge boring	1400' NL, 1500' EL 0' NL, 400' WL	33 34	138' 29'	McNairy Metropolis	drillers engineers
3080	IDOT	Country Club Road	bridge boring	0' NL, 400' EL	26	21.5	Mounds Gravel	engineers	20416	R. Beanland	Fred Brinker	water	100' SL, 1900' EL	34	240'	McNairy	drillers
60	S. Cunningham	Ed Wade	water	NW SE NW	35	110'	McNairy	sample study by author	20410	Edward Henners		oil test	2310' SL, 330' WL	34 35	1,090'	Fort Payne	sample study by Athe
2001	AWD Tech.		water monitor	160' SL, 1160' WL	35	72'	McNairy	engineers	126	Charlie Luton	Carl Fort	water	100' SL, 1200' EL	35	73'	Mounds Gravel	drillers
2002	AWD Tech.	M	water monitor	100' SL, 830' WL	35	72'	McNairy	engineers	120		Gairron	Water	100 OL, 1200 LL	00	70		dimens
2001	Layne-Western	Metropolis City #5	water	1200' SL, 1750' WL		400'	Mississippian Ls.	drillers					T16S, R4E				
3081	IDOT	Old Marion Road	bridge boring	800' NL, 2600' WL	36	24'	Mounds Gravel	engineers	5	Louise Mesters	Metropolis Citv #4	water	50' SL, 1250' EL	2	4001	Deat Creak	
3010 3011	IDOT IDOT	Gurley Road Gurley Road	bridge boring bridge boring	2600' NL, 2150' EL 2600' NL, 1200' EL	36 36	41' 46'	Mounds Gravel Mounds Gravel	engineers engineers	5 21008	Layne-Western	Metropolis City #4 Metrols T.H. #1-99	water	1700' SL, 1250' EL	2	400' 360'	Post Creek Post Creek	sample study by auth
3050	IDOT	Old Marion Road		1050' SL, 2640' EL	36	40 34'	Mounds Gravel	engineers	21000	Deamanu Drig.	Metrpis I.H. #1-99	water test	1700 SL, 2250 EL	2	300	FUSI CIEEK	sample study by auth
3050	IDOT	Olu Ivialioli Roau	bridge borning	1050 SL, 2040 EL	30	34	Woullus Glaver	engineers		Roopland Drig	Metrpls T.H. #2-99	water monitor	1200' SL 2150' EL	2	2041	Post Creek	electric and gamma-i
				T15S, R5E						Beanland Drig.	Metrols T.H. #2-99 Metrols T.H. #3-99	water monitor		2	365'	Post Creek	drillers drillers
_	B	<b>D</b>							20969	Layne-Western	Metropolis City #1A	water test	2200' NL, 1900' WL	2	260'	Mississippian Ls.	drillers
5	Paul Wittig	Davidson	water	100' NL, 3500' WL	2	182'	"rock"	drillers	20303	Layne-Western	Metropolis City #2	water test	2400' NL, 2200' WL	2	278'	Mississippian Ls.	drillers
134	Paul Horman	William Hook	water	1900' NL, 1650' WL	2	350'	Mississippian Ls.	drillers	20971	Layne-Western	Metropolis City #3	water test	1600' NL, 2100' WL		267'	Mississippian Ls.	drillers
143	Alonzo Geer	Melvin Brockman	water	200' NL, 250' WL	3	200'	Mississippian Ls.	drillers	20071	AWD Tech.	SU-2003	water monitor		2	59'	Mounds Gravel	engineers
21004	ISGS	Rita Korte #1	stratigraphic	28' NL, 500' WL	4	25'	McNairy Metropolio	sample study by author		AWD Tech.	SU-2003	water monitor		2	74'	McNairy	engineers
21005 20093	ISGS ISGS	Rita Korte #2 Rita Korte #3	stratigraphic	43' NL, 500' EL 81' NL, 850' EL	5	50' 60'	Metropolis	sample study by author	9903	IDOT	U.S. Rt. 45	bridge boring	,	2	44'	Mounds Gravel	engineers
20093	ISGS	Rita Korte #4	stratigraphic stratigraphic	149' NL, 1700' EL	5 5	50'	Metropolis Metropolis	sample study by author sample study by author	66	W.A. Fuller	Metropolis City #1	water	800' NL, 600' EL	11	420'	Mississippian Ls.	sample study by Wor
20994 21006	ISGS	Rita Korte #5	stratigraphic	41' NL, 2100' EL	5	50 20'	McNairy	sample study by author	68	W.L. Thorne Co.		water	800' NL, 550' EL	11	296'	Mississippian Ls.	drillers
3083	IDOT	Rosebud Road	bridge boring	0' NL, 500' EL	5	26.5	Cahokia?	engineers	67	Diehl P. & S.	Metropolis City #3	water	825' NL, 400' EL	11	288'	residuum	sample study by auth
3088	IDOT	Kommer Road	bridge boring	2400' NL, 2650' WL	5	46'	McNairy	engineers			. ,						. ,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,
61	S. Cunningham	G.C. Hausman	water	NE SW SW	5	100'	McNairy	sample study by author					T16S, R 5E				
20240	Paul Horman	Truman Logeman	water	1400' SL, 850'WL	5	200'	Golconda?	drillers	75	Quentin Richey	Ed Lillie	water	2300' NL, 2300' WL	2	140'	McNairy	drillers
3098	IDOT	Schneider Road	bridge boring	0' SL, 1900' WL	6	25	Mississippian Ss.	engineers	0006	IDOT	U.S. Rt. 45	bridge boring	50' NL, 600' WL	2	56'	McNairy	engineers
20404	W.E. Sergent	Milburn Johnson	water	50' SL, 300' EL	6	350'	Mississippian Ls.	drillers	69	Marshall Drlg.	Harry McGhee #1	oil test	330' NL, 330' EL	3	2,335'	Devonian?	sample study by Payl
3032	IDOT	Massac Creek Road	bridge boring	1300' NL, 1320' EL	7	20'	West Baden Ss.	engineers					,,	-	_,		no record below 1,01
0023	IDOT	Interstate 24	bridge boring	2350' SL, 1150' WL	7	17'	West Baden Ss.	engineers	20208	Paul Horman	Scot Darnell	water	1000' SL, 1450' WL	4	120'	McNairy	drillers
4.0E	IDOT	Interstate 24	engineering	2390' NL, 860' WL	7	20'	West Baden Ss.	engineers	0030	IDOT	Interstate 24	bridge boring		5	41'	Mounds Gravel	engineers
4.5E	IDOT	Interstate 24	engineering	970' SL, 1740' WL	7	22'	West Baden Ss.	engineers	20893	IDOT	U.S. Rt. 45	bridge boring		6	140'	McNairy	sample study by Dev
5E	IDOT	Interstate 24	engineering	280' SL, 2100' WL	7	26'	West Baden Ss.	engineers	20891	IDOT		structure test	2600' NL, 1300' EL	8 8	111.5	McNairy	sample study by bev
20224	Paul Horman	C.O. Babb	water	100'NL, 1250' WL	7	212'	Golconda?	drillers	20892	IDOT		structure test	NE NE NW	8	66.5	McNairy	sample study by auth
20532	R. Beanland	R. Potterbaum	water	1900' SL, 1200' EL	7	180'	West Baden Ss.	drillers	0034	IDOT	Interstate 24	bridge boring		8	26.5	Cahokia	engineers
20458	R. Beanland	Larry Glass	water	1000' SL, 1250' EL	7	186'	Paoli Ls.	drillers	0033	IDOT	Interstate 24	bridge boring		8	21.5	Cahokia	engineers
20566	R. Beanland	D. Wetherington	water	550' SL, 700' EL	7	140'	West Baden Ss.	drillers	0000	IDOT	I-24/Ohio River #28	bridge boring		8	124'	McNairy	drillers
3036	IDOT	Orchard Road	bridge boring	1430' SL, 0' EL	9	61.5	McNairy	engineers		IDOT	I-24/Ohio River #3L	bridge boring		8	158'	Post Creek?	drillers
71	Quentin Richey	Wendell Bremer	water	100' SL, 250' EL	9	173'	McNairy	drillers		IDOT	I-24/Ohio River #4L	bridge boring		8	157'	McNairy	drillers
20864	ISGS	Ronnie Koch #BC-1	stratigraphic	1600' SL, 2155' WL	9	42'	Metropolis	sample study by author		IDOT	I-24/Ohio River #6L	bridge boring		8	157'	McNairy	drillers
20863	ISGS	Ronnie Koch #BC-2	stratigraphic	1600' SL, 2290' WL	9	54'	McNairy	sample study by author		IDOT	I-24/Ohio River #8L	bridge boring		8	148'	McNairy	drillers
	ISGS	Ronnie Koch #BC-3	stratigraphic	1600' SL, 2400' WL	9	15'	McNairy	sample study by author		IDOT	I-24/Ohio River #10R	bridge boring		8	131'	McNairy	drillers
20883	ISGS	M. Bremer #BC-4	stratigraphic	2500' NL, 1050' EL	9	18'	McNairy	sample study by author		IDOT	I-24/Ohio River #10R	bridge boring		8	157'	McNairy	drillers
20883 20865		Westerman #BC-5	stratigraphic	2600' SL, 800' EL	9	72'	McNairy	sample study by author		IDOT	I-24/Ohio River #13R	bridge boring		8	160'	McNairy	drillers
20865	ISGS		0 1		9	104'	Metropolis	sample study by author	20882	ISGS	Ft. Massac St. Park	stratigraphic	1900' NL, 600' WL	9	40'	Mounds Gravel	sample study by auth
20865 29866	ISGS ISGS	Westerman #BC-7	stratioranhic	1000 aL. /UU FI										-			
20865 29866 20867	ISGS	Westerman #BC-7 Westerman #BC-8	stratigraphic stratigraphic	1550' SL, 700' EL 1500' SL, 1250' EL	9		McNairv			ISGS	Ft. Massac St. Park	stratioranhic	1200' SL. 2700' FI	10	60'	McNairv	
20865 29866		Westerman #BC-7 Westerman #BC-8 G. Tilker #BC-9	stratigraphic stratigraphic stratigraphic	1500' SL, 1250' EL 2000' NL, 2600' EL	9 9	20.6' 27'	McNairy McNairy	sample study by author sample study by author	20887 3038	ISGS IDOT	Ft. Massac St. Park Strawberry Road	stratigraphic bridge boring	1200' SL, 2700' EL 100' NL, 2640' WL	10 10	60' 46'	McNairy Mounds Gravel	sample study by auth engineers

<sup>2</sup>T.D., total depth. <sup>3</sup>Indicates IDOT bridge borings: in most cases, two or more holes were drilled at the same site. The record of the deepest hole at each site is listed here. Updated July 11, 2000. <sup>4</sup>These borings are in Kentucky. Locations are projected into Section 8, T16S, R5E.

<sup>1</sup>Number is ISGS county number, except for Illinois Department of Transportation (IDOT) and other engineering borings, for which the agency's number is given.

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Limestone Member at the top, composed of limestone with thin shale interbeds; (2) the Fraileys Shale Member, mostly dark gray shale with thin limestone interbeds and an interval of red and green mudstone at the top; and (3) the thin *Beech Creek Limestone* Member at the base.

M West Baden Sandstone. Sandstone, siltstone, and shale. This unit crops out along Massac Creek near Interstate 24, where it is largely sandstone that is light gray and very fine- to fine-grained. Nearly pure quartz, the sandstone displays thin wavy to lenticular bedding, ripple marks, clay drapes, small horizontal burrows, and small load casts. Thick-bedded sandstone is at the top, and dark gray shale interbeds occur near the base. The outcrops show only about 30 feet of a unit that totals 200 to 250 feet thick, according to well records. The West Baden is equivalent to the Cypress (youngest), Sample, and Bethel Sandstones of neighboring areas.

**N Paoli Limestone.** Limestone, shale, mudstone, and siltstone. Drillers' logs of water wells indicate limestone with shale interbeds. Outcrops and cores from nearby guadrangles show the Paoli to be divisible into four members. From the top down, they are (1) Downeys Bluff Limestone Member, white to gray, coarse-grained fossiliferous and oolitic limestone with thin interbeds of gray to green shale; (2) Yankeetown Member, gray, green, and red siltstone, shale, and mudstone with thin interbeds of limestone; (3) Shetlerville Limestone Member, light to dark gray fossiliferous limestone with thin shale beds; and (4) Levias Limestone Member, white to light gray and pink, oolitic limestone.

**O** Aux Vases Sandstone. Sandstone, siltstone, and limestone. Water-well records indicate the unit is present, but provide no details. The Aux Vases in southeastern Illinois typically consists of light gray to greenish gray siltstone to very fine-grained sandstone that is calcareous and grades laterally to sandy limestone.

P Ste. Genevieve Limestone. Limestone, minor dolomite, shale, and sandstone. Water-well logs indicate the unit is present, but give no details. In neighboring areas, the Ste. Genevieve is largely white to gray limestone, much of which is oolitic, but beds of darker, finegrained dolomitic and cherty limestone are present. Thin interbeds of green to gray shale and gray to green, calcareous sandstone may occur in the upper part.

**Q St. Louis Limestone.** Cherty limestone and minor dolomite. Well samples from the southern part of the map area consist mainly of microgranular limestone and dolomite, along with fine-grained dolomitic limestone with scattered fossil fragments (wackestone and packstone). Colors vary from medium to dark gray and brownish gray. Oolitic limestone is uncommon. Chert in the St. Louis is mostly dark gray to black and vitreous. A minimum thickness is 280 feet. The upper contact was not logged; the lower probably is gradational.

**R Salem Limestone.** *Limestone.* Colors vary from very light gray to dark gray and brownish gray; grain size is variable. Sand-size fossil grains occur in a microgranular matrix (wackestone and packstone), with scattered larger fossils that include echinoderms, bryozoans, and brachiopods. Coarser-grained rock tends to be lighter in color. Some fossil grains are rounded, and oolites are present but less conspicuous than in the Ste. Genevieve. Some beds are dolomitic and more or less recrystallized, obscuring the original texture. Chert, a minor constituent, is mostly light gray, dull-textured, and opaque. Thickness is about 320 to 365 feet, but both contacts are difficult to identify precisely in well cuttings.

S Ullin Limestone. Limestone. Three wells having good samples penetrate this unit. The upper Ullin is mostly limestone that is light gray to yellowish gray or buff and is composed of large fragments of fenestellid bryozoans mixed with scattered echinoderm fragments. The grains are unsorted, and are rarely rounded or coated. The rock may be classified as packstone, grainstone, or bafflestone. Downward the rock changes gradually to medium-dark gray, fine- to medium-grained wackestone and packstone of bryozoan and echinoderm fragments. Bluish gray, semi-vitreous chert fragments make up as much as 20% of sample volume in the lower Ullin. Thickness is close to 135 feet in all three wells, although both contacts appear gradational.

T Fort Payne Formation. Cherty limestone. The limestone is dark brownish gray, microgranular, siliceous, dolomitic, and pyritic. Drillers commonly log it as black limestone or chert. Most of the Fort Payne can be classified as calcisiltite (limestone composed of silt-sized grains); however, some lighter-colored limestone that appears to be recrystallized wackestone or packstone occurs in the upper 100 feet. Identifiable fossil grains are not common; they are bryozoans and echinoderms. Chert is dark-colored, opaque to semi-vitreous, and constitutes 5% to 10% of samples by volume. No wells in the quadrangle provide samples completely through the Fort Payne. In the nearest well having complete penetration, the Glen Kahle no. 1 Harvick oil test hole in Sec. 23, T14S, R3E a few miles northwest of the map area, the Fort Payne is 685 feet thick, which is close to a maximum for the Illinois Basin.

### Metropolis Surficial Geology Map Map sheet 1 of 2