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Illinois Geologic Quadrangle Map: IGQ Monks Mound BG
2001

BEDROCK GEOLOGIC MAP

Monks Mound Quadrangle, Madison and St. Clair Counties, Illinois

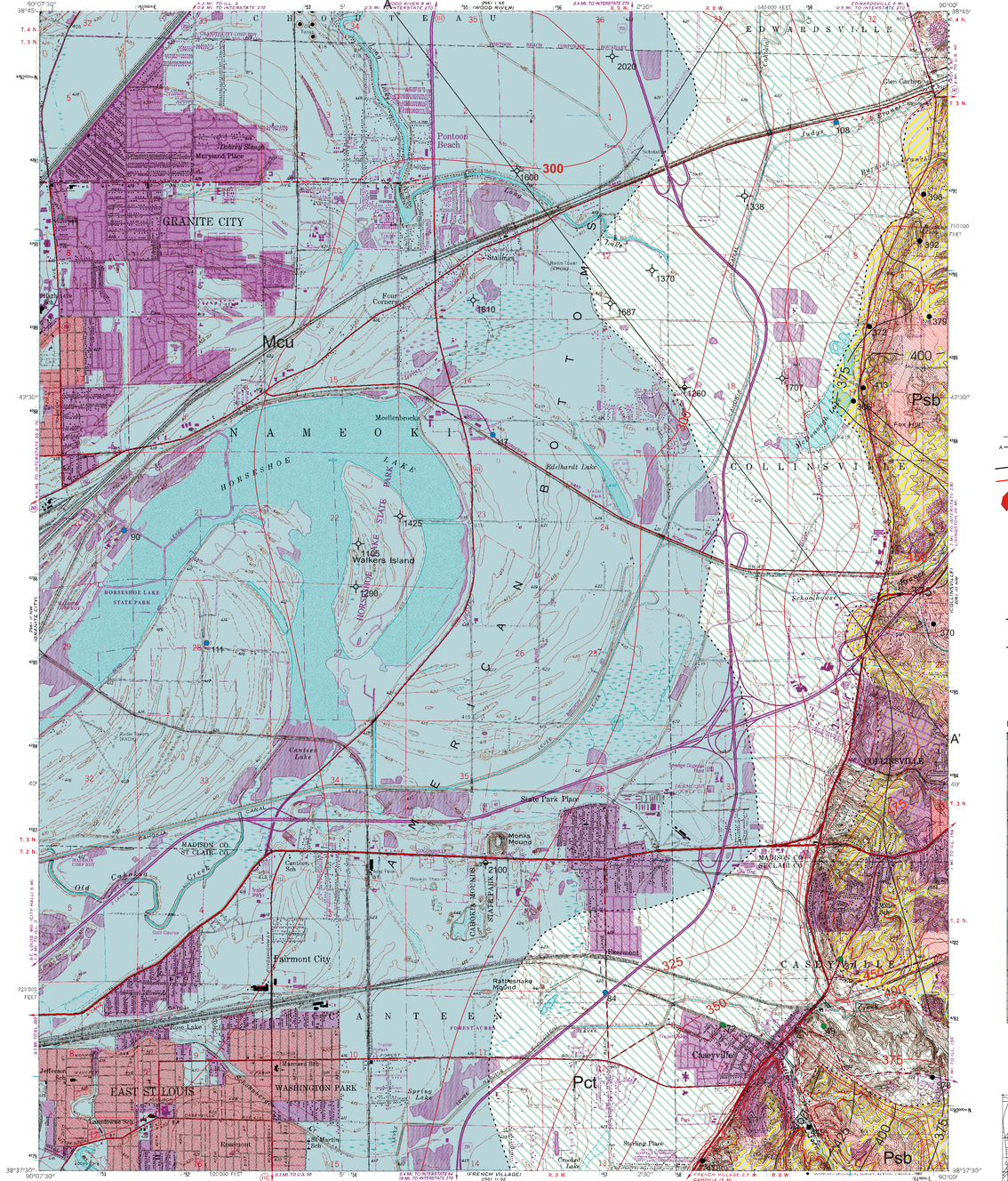
F. Brett Denny and Joseph A. Devera

August, 2001

UNITED STATES
DEPARTMENT OF THE INTERIOR
GEOLOGICAL SURVEY

STATE OF ILLINOIS
DEPARTMENT OF ENERGY AND NATURAL RESOURCES
GEOLOGICAL SURVEY DIVISION
CHAMPAIGN, ILLINOIS
AND THE STATE GEOLOGICAL SURVEY, CHAMPAIGN, ILLINOIS 61820

MONKS MOUND QUADRANGLE
ILLINOIS
7.5 MINUTE SERIES (TOPOGRAPHIC)



Produced by the United States Geological Survey

Control by USGS and NOS/NOAA

Topography by planetable surveys 1930. Revised from aerial photographs taken 1952. Field checked 1953-54

Projection and 10,000-foot grid ticks: Illinois coordinate system, west zone (transverse Mercator)
1000-meter Universal Transverse Mercator grid ticks, zone 15, shown in blue
1927 North American Datum (NAD 27)

North American Datum of 1983 (NAD 83) is shown by dashed corner ticks
The values of the shift between NAD 27 and NAD 83 for 7.5-minute intersections are given in USGS Bulletin 1875

There may be private inholdings within the boundaries of the National or State reservations shown on this map

Red tint indicates areas in which only landmark buildings are shown

SCALE 1:24 000

CONTOUR INTERVAL 10 FEET
DOTTED LINES REPRESENT 5-FOOT CONTOURS
NATIONAL GEODETIC VERTICAL DATUM OF 1929

COMPILES WITH U. S. GEOLOGICAL SURVEY STANDARDS FOR SPATIAL ACCURACY CLASS 2
FOR SALE BY U.S. GEOLOGICAL SURVEY, DENVER, COLORADO 80225, OR RESTON, VIRGINIA 22092
AND ILLINOIS GEOLOGICAL SURVEY, CHAMPAIGN, ILLINOIS 61820
A FOLDER DESCRIBING TOPOGRAPHIC MAPS AND SYMBOLS IS AVAILABLE ON REQUEST

ROAD CLASSIFICATION
Primary highway, hard surface — Light-duty road, hard or improved surface
Secondary highway, hard surface — Unimproved road
Interstate Route — U. S. Route — State Route

QUADRANGLE LOCATION

Revisions shown in purple compiled from aerial photographs taken 1988 and other sources. This information not field checked. Map edited 1993
Information shown in purple may not meet USGS content standards and may conflict with previously mapped contours
Purple tint indicates extension of urban area

MONKS MOUND, ILL.
38090-F1-TF-024
1954
REVISED 1993
DMA 2961 II NE--SERIES V883

Digital Cartography
F. Brett Denny

Acknowledgments

This map is one of a series prepared for the USGS 7.5-minute Monks Mound Quadrangle by a multidisciplinary team of geologists from the Illinois State Geological Survey (ISGS). This series will characterize surface landscapes and surface, bedrock, and engineering geology and will delineate coal, and sand and gravel resources. This map was significantly improved through review, suggestions, and comments by the following individuals:

Disclaimer

The views and conclusions contained in this document are those of the authors and should not be interpreted as necessarily representing the official policies, either expressed or implied, of the U.S. Government.

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EXPLANATION

Quaternary deposits have been removed from map.

Graphic Column Units

Desmoinesian	Pkb	Shelburn Formation	PENNSYLVANIAN
	Pc	Carbondale Formation	
Atokan	Pt	Tradewater Formation	
	Pcd	Carbondale and Tradewater Formations	
		Unconformity	
Chesterian*	Mg	Golconda Formation	MISSISSIPPIAN
	Mcy	Cypress Formation	
	Mpc	Paint Creek Formation	
	Mr	Yankeetown Formation and Renault Formation	
	Mav	Aux Vases Sandstone	
	Msg	Ste. Genevieve Limestone	
	Mcu	Chesterian undifferentiated	
Valmeyeran	Msl	St. Louis Limestone	
	Ms	Salem Limestone	
	Mw	Warsaw Shale	
	Mbk	Burlington Keokuk Limestone	
	Mfg	Fern Glen and Meppen Formation	

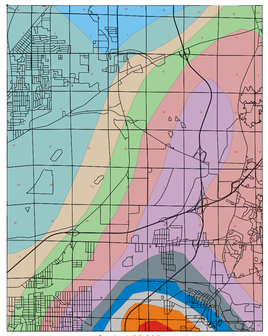
* Chesterian Boundary based on Maples and Water

LINE SYMBOLS: Dotted where concealed
Contact
A — A' Line of cross section
375 Structure contour based on top of Herrin Coal; CI= 25 feet
400 Bedrock topography; CI 25 feet
Coal mined out areas

DRILL HOLES: Subsurface data used to construct map. Number indicates depth of boring (except coal test holes which gives the elevation of the Herrin #6 coal)
90 water well
49 stratigraphic boring
378 coal test hole
1605 oil test hole (dry)
1620 oil test hole (oil show)

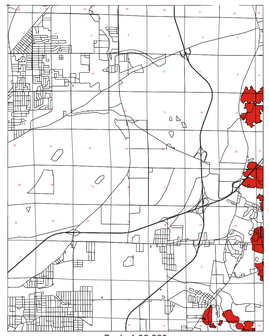
Magnetic contour interval 100 milligal
> 700
> 600
> 500
> 400
> 300
> 200
> 100
> 0
> -100
> -200
> -300

Magnetic Anomaly map; polygons (adapted from Harrison, 1997)



Scale 1:96,000
1 in = 8000 ft

Coal Mined Area Map of the Monks Mound Quad
(Adapted from Chenowth, 2001)



Scale 1:96,000
1 in = 8000 ft

SYSTEM	SERIES	Group or Subgroup	FORMATION	Member or Bed	Graphic Column	THICKNESS (feet)	DESCRIPTION UNIT
PENNSYLVANIAN	DESMOINESIAN		Shelburn	Bankston Fork Ls Anna Shale/ Brereton Ls Herrin Coal		0-80 (17-36; 8-9; 5-6)	A
			Carbondale	Springfield?		0-110	B
				Colchester Coal		1.5	
	Atokan		Tradewater			0-60	C
Mississippian	CHESTERIAN		Golconda	Frailey Shale Beech Creek		60-100 (35)	D
			Cypress			25-30	E
			Paint Creek			40	F
			Yankeetown and Renault			40-50	G
			Aux Vases			20-40	H
			St. Genevieve Limestone			0-80	I
	Valmeyeran	Mammoth Cave Megagroup	St. Louis Limestone			200-270	J
			Salem Limestone			110-130	K
			Warsaw Shale			80-90	L
			Burlington-Keokuk Limestone			175-200	M
		Kinderhookian	Fern Glen Formation and Meppen Limestone			75-87	N
Siluro Devonian	Middle	North Hill	Chouteau Limestone			18-32	O
		New Albany	New Albany Shale			20-40	P
		Niagaran	Cedar Valley Limestone			0-10	Q
			Joliet Formation			175-250	R
		Alexandrian	Kankakee Formation				
			Edgewood Limestone				

Shelburn A. *Shales, limestones, and siltstones.* Shales are soft blue-gray to green-gray, black, and red and may be variegated. A red shale is present below the uppermost limestone in parts of the quadrangle. Limestones within this unit are brownish gray to dark gray. Silty, argillaceous and fossiliferous lime mudstones and fossil wackestones are locally present. The shale is soft and is variegated with a bluish green shale in places. The basal limestone is a dark gray, argillaceous and fossiliferous wackestone. It exhibits nodular bedding and is locally replaced by a black, fissile, fossiliferous shale. The basal contact is sharp with the underlying unit.

Carbondale Formation B. *Shale, siltstone, sandstone, limestone, and coal.* Siltstones are green-gray variegated, red and dark gray. Pyrite is common along with carbon traces and mica. Coal is well developed in a number of horizons within this unit.. All of the coals are rooted, vitreous and alternate bright to dull-banded. The unit is dominated by shales with siltstone intervals. The shale is dark gray carbonaceous and pyritic. Shaly limestones occur within the thick interval are composed of thin discontinuous, dark gray beds. The base of the unit is marked by a two foot thick rooted coal bed. The unit is conformable with the underlying formation.

Tradewater Formation C. *Sandstone and shale.* Sandstones are composed of well sorted, micaceous quartz arenites. Medium gray to dark gray shales are interbedded with the sandstone beds. Coals are thin and discontinuous. The shale is also brown and gray mottled, soft and plastic with pyrite. The shale or claystone is the dominant lithology and commonly shows rooting. This unit is unconformable with the limestones below.

Golconda D. *Limestone and shale.* The upper carbonate beds are light gray, oolitic grainstones and dark to medium gray fossil packstones. A red shale bed occurs below the upper carbonate where it is not eroded. Shale is the dominant lithology within this unit. It is typically dark gray and has silty interbeds. The shale is weakly fissile or weathers in platlets. A lower silty dolomitic thin limestone has a conformably sharp contact with the underlying sandstone.

Cypress E. *Sandstone.* This unit is composed of a white to light gray fine to medium grained, quartz arenite that is shaly. The shale is a minor component but occurs as wavy or flaser bedding in the upper part of the formation. Occasionally thin carbonaceous laminae to impure coals are found in the upper part as well. The mid-to-lower portion of the unit is composed of thick to medium bedded and cross bedded sandstone beds.

Paint Creek Group F. *Limestone, shale and sandstone.* This unit contains highly variable limestones and shales in the upper part. The limestones are light gray fossiliferous grainstones and packstones that locally contain oolitic facies and red stained fossil echinoderm fragments. The limestone beds are interbedded with green and red claystones and greenish gray shales. Sandstone beds are a minor lithologic component. The sandstone is a light gray, fine grained, quartz arenite. Most of the beds pinch out laterally and can be traced only locally. The thick shale is calcareous and also contains a thin red claystone bed. The basal limestone has fossil packstones and argillaceous fossil wackestones. The contact with the unit below is sharp but conformable.

Yankeetown and Renault G. *Limestone, shale and sandstone.* Yankeetown is composed of calcareous sandstone and variegated shale and cherts. The lower Renault limestone is dominately limestone with some variegated shales, sandy limestones, and commonly contains a conglomerate near the base.

Aux Vases H. *Sandstone.* The sandstone is a white, fine grained quartz arenite. It contains greenish shale rip-up clasts, sand-filled dessication marks and ripple marks in the upper part. Locally, the sandstone grades into calcareous sandstone and limey sandstone with abraded bioclasts. The lower portion is dominated by sandstone but also contains occasional shale laminae. The lower contact is unconformable.

Ste Genevieve Limestone I. *Limestone, dolomite, chert, and siltstone.* Limestones are tan-brown to light gray and contain laminated tidallites, wackestones to grainstones composed of rounded and broken fossils. Bedding styles range from tabular to undulatory. Cross-beds are present in grainstone facies. The unit has a dirty gray-brown grainy appearance. The diagnostic character of this formation is alternating beds of laminated, fine-grained (calcisiltite) facies with coarse bioclastic, peloidal, to oolitic grains that depict shoaling-upward cycles. Dolomites are brown and have moldic porosity. Cherts are light gray and may be bioclastic and occur between grainstones and laminated beds as elliptical nodules. Siltstones are brown to light gray and thinly bedded, typically less than 1 inch thick. Oolitic beds are rare. Fossils include spiriferid and productid brachiopods, rugose corals, conularids, and crinoids. Ramose, fenestrate, encrusting, and bifoliate bryozoans are also present. The contact with the underlying unit is gradational.

St Louis Limestone J. *Limestone, siltstone, and shale.* Light gray to medium gray dense lime-mudstone with fossil wackestones. Part of the unit contains quartz sand and subangular limestone breccia clasts. Oolitic grainstones, greenish oncolitic packstones, peloidal grainstones, stromatolitic boundstones, and carbonate intraclastic conglomerates make up a highly variable mix of microfacies. Acrocyathus floriformis, a colonial coral, occurs in the upper part of the basal portion of this formation. A. floriformis is wide spread near the base of the unit. Yellowish dolomite beds are also present in this formation. Gray to dark gray chert occurs as nodules and stringers. Siltstones are calcareous and greenish. The shales are greenish gray and reddish brown, calcareous, soft, and non-fissile.

Salem Limestone K. *Limestone, dolomite, mudstone, and siltstone.* Medium-gray, crinoidal, bryozoan wackestones and packstones that contain a few brachiopods. In the lime-mudstone beds Archimedes sp. are preserved with coil and fronds attached. dolomite beds are gray-brown, thinly bedded, and contain chlorite-rich shale clasts with some small quartz geodes. The upper half of the unit is dominated by shaly limestone and dolomite beds. The lower half contains bluish gray mudstones up to 20 feet thick interbedded with thin lime-mudstones. Conularids and gastropods occur in the shaly portion of this unit. Siltstones are calcareous and fossiliferous and thinly bedded in the lower part. Quartz geodes are common in the shaly sequences. The basal contact is sharp and conformable with the underlying carbonate beds.

Warsaw L. *Limestone, dolomitic, siltstone, and shale.* Medium-gray, crinoidal, bryozoan wackestones and packstones that contain a few brachiopods. In the lime-mudstone beds Archimedes sp. are preserved with coil and fronds attached. dolomite beds are gray-brown, thinly bedded, and contain chlorite-rich shale clasts with some small quartz geodes. The upper half of the unit is dominated by shaly limestone and dolomite beds. The lower half contains bluish gray mudstones up to 20 feet thick interbedded with thin lime-mudstones. Conularids and gastropods occur in the shaly portion of this unit. Siltstones are calcareous and fossiliferous and thinly bedded in the lower part. Quartz geodes are common in the shaly sequences.

Burlington and Keokuk Limestones M. *Limestone and minor shale.* Light gray to white crinoidal grainstones dominate and are interbedded with nodular and bedded light gray to black cherts. The cherts are white when weathered, and some have bioclasts of crinoids and brachiopods. The unit is characterized by alternating layers of light gray to white crinoidal grainstones with beds of argillaceous and sandy limestones. This cyclic sequence of crinoidal limestone over sandy cross-bedded limestone is common in the lower part of the unit. Large spirifers are common along with crinoids, bryozoans, and corals. Siltstones are dark gray with a greenish tint and are calcareous. Calcite and quartz filled vugs from 0.5 to 2 inches in diameter have been described within this unit. The unit is conformable with the underlying unit.

Fern Glen and Meppen Formations N. *Siltstone, limestone, and shale.* Green and red shaly calcareous siltstones are diagnostic of the unit. The cherts are greenish gray, nodular, and fossiliferous. The limestone is greenish gray, thin-bedded, and argillaceous and cherty containing small calcite geodes and crinoid stems. The basal part is grades into a micritic and sometimes dolomitic limestone.

Chouteau Formation O. *Limestone and siltstone.* Light brown to greenish gray irregular to wavy, thin beds of lime mudstone with thin beds of silty dolomite. Calcite geodes with diameters from 0.5 to 2 inches are common. Some of the calcite geodes are replaced with quartz. Chert nodules are locally abundant and typically are dark gray with light gray rims. The unit appears to be gradational with the underlying unit.

New Albany Formation P. *Shale, and siltstone.* The shales are black to dark gray fissile and may be carbonaceous. The only common fossil is an algal test called "*Tasmanites*". The unit t commonly contains disseminated pyrite near the base.

Cedar Valley Q . *Limestone and sandstone.* Thin and discontinuous fossil packstone with quartz sand. The lowest unit is a brownish gray sandstone overlain by fossiliferous and sometimes argillaceous limestone. It is gray where fresh and weathers to a brown tint and contains *Marcrospirifer* sp., and *Paraspirifer* sp., brachiopods, rugose corals, and platycerid gastropods. The sandy limestone is unconformable with the underlying unit.

Silurian R. *Limestone and dolomite with minor shale partings.* The dolomite is light gray to yellowish brown. The upper part of the dolomite may truncated by overlying strata. Shales are greenish gray to red and are silty. Bedding planes are flat to wavy in places and beds are typically several feet thick but can be thinly bedded. Chert occurs as nodules sporadically throughout the unit. Crinoids and the trilobites *Shenarocalymene celebra* and cheirurid trilobites may be found.

Introduction

The Monks Mound Quadrangle is located due east of St. Louis, Missouri. It is situated on the Sparta Shelf (Nelson, 1995), a basement high stemming off of the Ozark Dome. The dome is a Precambrian high that has influenced deposition throughout the Paleozoic. Bedrock exposures are poor and only found in the southeastern corner of the quadrangle along the bluff. Mainly sandstone, siltstone, shale, and limestone beds of the Shelburn and Carbondale Formation (Desmoinesian) are exposed in the quadrangle. The rocks strike north to northeast and have a regional dip of 2˚to 3˚ easterly. The western portion of this quadrangle lies along the flood plane of the Mississippi River and is composed of Holocene, Pleistocene and possibly older deposits. Detailed information concerning these units can be obtained in the surficial geologic map of this quadrangle (Grimley, in prep). Due to the limited bedrock outcrops in this quadrangle, nearly all of the data used to generate this map was subsurface drill hole information from the files of the Illinois State Geological Survey.

Stratigraphy

Regional data indicates that the Precambrian igneous basement rocks should be greater than 3200 feet below sea-level (Harrison, 1997). The deepest well, a dry oil test, was completed in the St. Peter Sandstone (Ordovician) at 2100 feet below the surface, well above the basement rocks. A magnetic anomaly map (Harrison, 1997) indicates that a small magnetic anomaly is present in the southern half of the quad (see inset map). Magnetic anomalies usually reflect structure, igneous dikes and sills, or lithologic variations. The anomaly is centered near the small town of Bunkum south of the Monks Mound quad in the adjoining French Village quad. We therefore will refer to this anomaly as the Bunkum Magnetic Anomaly. The younger Paleozoic bedrock units dip easterly into the Illinois Basin and away from the Bunkum Magnetic Anomaly. The bedrock surface ranges to nearly 500 feet in the upland area on the eastern portion of the quadrangle to less than 300 feet along the flood plane of the Mississippi River in the western portion of the quadrangle (see inset map). In addition, Pleistocene glacial outwash has scoured valleys in portions of the quadrangle (see Grimley, in prep.). While compiling this map it was noted that the bedrock topographic highs and the position of the Bunkum Magnetic Anomaly are similar.

The structure contours on the top of the Herrin #6 Coal, which marks the boundary between the Carbondale and the Shelburn Formations is shown on the geologic map. The general strike of this surface is north to north-northeast and dipping approximately 50 to 75 feet per mile to the east in the southeastern portion of the quadrangle. This surface is discontinuous due to erosion by the Mississippi River and older rivers and glacial valleys in the eastern portion of the quadrangle. The surface rises noticeably in the area of the Bunkum Magnetic Anomaly.

Under the flood plane of the Mississippi River Lower Pennsylvanian and Mississippian Age rocks are present. Due to the limited amount of data in this area the Chesterian units have been combined into one mapable unit (Mcu). A few well logs are of sufficient quality to determine which Chesterian unit is present, but most of the wells do not penetrate deep enough into the rock to ascertain which unit of the Chesterian the well penetrated or to map the units lateral extent.

Oil and Gas

10 oil wells have been drilled in this quadrangle. None of these wells have yielded economic sources of petroleum. A few of the wells have reported shows of oil in the Silurian units.

Coal Resources

Coal has been mined along the bluffs in and underground working in the eastern portion of the quadrangle. The mined out coal mine areas are located on the map and it seems that the majority of the economic areas for coal mining have been utilized. Nevertheless, there probably are small tracts which contain economic deposits of coal in this quadrangle. The primary coal seam in this area is the Herrin #6 Coal which is typically 5 to 6 feet thick and normally a high-volatile C bituminous rank coal (Jacobs, 1971).

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