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SUBSURFACE STRUCTURE AND OIL POSSIBILITIES OF PARTS OF CLAY, MARION, AND WAYNE COUNTIES

BY

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INTRODUCTION

The area included in this structural study was chosen because preliminary contouring revealed undrilled "highs" that might produce oil. The top of the Levias member of the Ste. Genevieve formation was contoured because it is stratigraphically near the possible producing formations and because the structural features are not confused either by unknown variations of Chester sedimentation or by post-Mississippian erosion. Post-Mississippian erosion in this area cut down into shales within the Kinkaid formation in many places and into the massive limestone of the Menard formation in at least one place.

A structure map of the north half of the area, including Ts. 2 and 3 N., Rs. 4 and 5 E., was prepared by Weller and Bell¹, who used the top of the Omega limestone (Pennsylvanian) as their reference horizon. They named a closed dome centering in sec. 23, T. 3 N., R. 5 E., the Xenia dome and showed an anticline rising to the west with its axis extending through the center of sec. 9, T. 3 N., R. 4 E. A rising of structure south-southeast of sec. 33, T. 3 N., R. 5 E., was indicated. In the seven years since the earlier report was published, enough wells have been drilled into the Ste. Genevieve formation to furnish adequate control for a structural study based on that formation.

STRUCTURAL FEATURES

The principal structural feature of the area is an anticline which is here designated the Siloam anticline (from Siloam School in sec. 27, T. 3 N., R. N. E.), the axis of which extends from northwest to southeast across the mapped area. The Xenia pool lies upon a small dome on this anticline, here named the Paine dome (from Paine School in sec. 5, T. 2 N., R. 5 E.), and located in parts of secs. 4, 5, 8, and 9, T. 2 N., R. 5 E.

A subsidiary prong of the Siloam anticline passes from north to south through T. 2 N., R. 4 E., and is here named the Iuka anticline (from the town of Iuka); it appears to have closure, in which case it may more properly be called a dome. The small dome whose flanks lie in secs. 24, 25, and 36, T. 3 N., R. 5 E., is here named the Kenner dome (from Kenner pool). A closed "low" lies immediately west of Kenner dome.

The well (elevation 473 feet) in sec. 4, T. 2 N., R. 4 E., encountered salt water at the total depth of 1780 feet. It is probable that the water came from the Degonia sandstone. The top of the Levias limestone is estimated to be 870 feet below the top of the Degonia at the location of that well, hence the top of the Levias is calculated to be at 2650 feet. An "oil sand" was logged from 1549 to 1553 feet but this does not necessarily mean that an oil show was encountered, because drillers commonly describe sandstones as "oil sands" if they resemble producing

¹Weller, J. M., and Bell, A. H. Geology and oil and gas possibilities of parts of Marion and Clay counties: Illinois Geol. Survey Rept. Inv. No. 40, fig. 4, 1936.

STRUCTURE AND OIL POSSIBILITIES

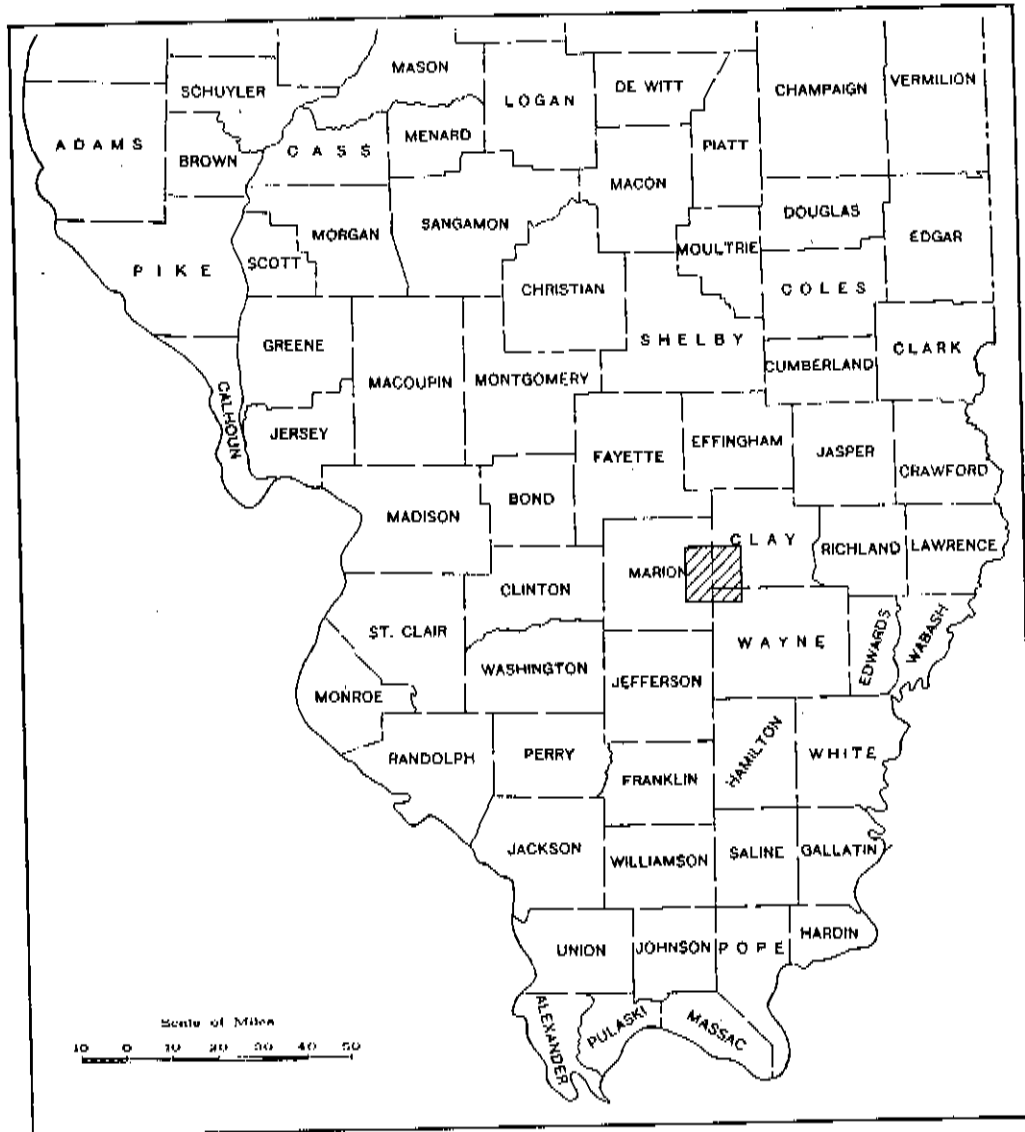


FIG. 1. Index map of the south part of Illinois showing the location of the area covered by this report (see fig. 2).

sandstones in other respects. These remarks are included here to correct and to correlate the driller's log as previously published.²

The structural interpretation for the area near the wells in secs. 4 and 6, T. 2 N., R. 4 E., could vary between two reasonable extremes. On the one hand, contours can be drawn to continue the anticline northward without closure by connecting the neighboring -2150 contours. On the other hand, the -2175 contour could be closed off around the north end of the dome, which would result in closer spacing of the contours to the north. The interpretation used by the writer is midway between the two extremes, utilizing one closed contour. Existence of the Iuka anticline, however, can be demonstrated independently of the interpretation used for the well in sec. 4 by using other wells for control.

OIL POSSIBILITIES

Future drilling in the area may result in the extension of the Xenia pool in secs. 4, 5, 8, and 9, T. 2 N., R. 5 E., by a few new wells but additional drilling there does not seem advisable under present well-spacing restrictions.³ The well in sec. 5 tested the Devonian unsuccessfully. A summary of depths to key horizons for this well follows the text.

According to present data, the high portion of the Iuka anticline (hachured area on fig. 2) appears favorable for oil exploration. The crest of the structure seems to be located in the SW. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 16, T. 2 N., R. 4 E. If test drilling is done, wells should test the Ste. Genevieve formation, the top of which probably lies about 2130 feet below sea-level on the high part of the structure. This estimate is based upon correlations between the well in sec. 20 and the well in sec. 22.

A favorable region, even though no closure is indicated by present data, is the hachured area including portions of secs. 14, 15, 22, and 23, T. 2 N., R. 5 E. The dip along the axis of the Siloam anticline there is only about one-seventh of a degree, an amount at variance with

the dip of about three-fourths of a degree off the top of the Paine dome. The well in sec. 24 had shows of oil in the Bethel and Aux Vases sandstones and in the Ste. Genevieve formation, a feature which is encouraging for prospects of obtaining production up the dip from that well. There is ample room in the hachured area for a closed high as large as or larger than that on which Xenia pool is located. A well in the vicinity of the corner of secs. 14, 15, 22, and 23, T. 2 N., R. 5 E., would determine whether closure exists. If there is closure, the top of the Ste. Genevieve should be encountered not more than about 2325 feet below sea-level. Special attention should be given to possibilities of commercial production from the Bethel and Aux Vases sandstones in any well drilled in the area.

Although shows of oil have been encountered in other wells in the townships, further drilling is not warranted from present indications.

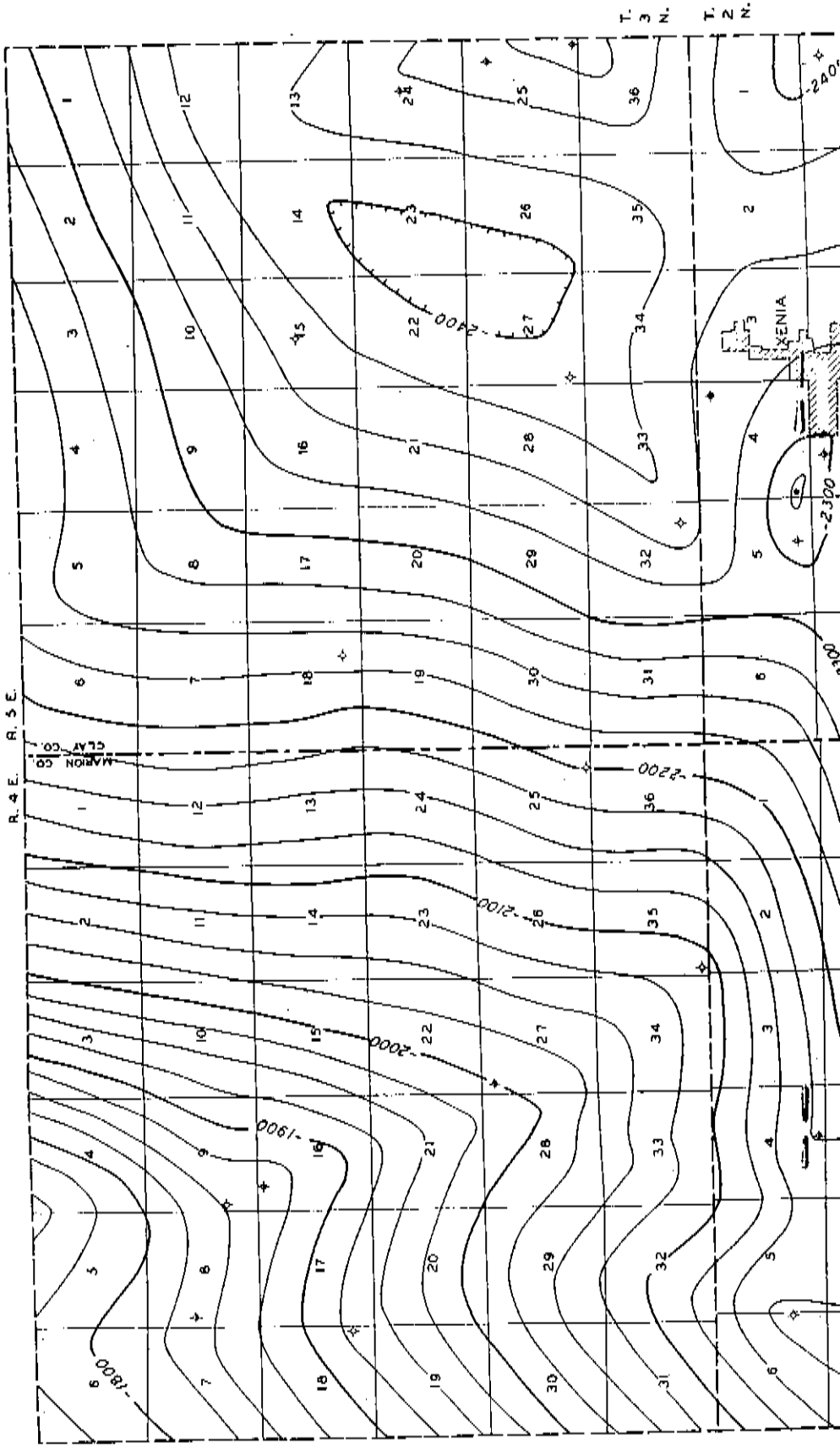
Depths to key horizons in the Northern Ordnance, Inc.—J. Sapp well No. 1, sec. 5, T. 2 N., R. 5 E., Clay County, Illinois

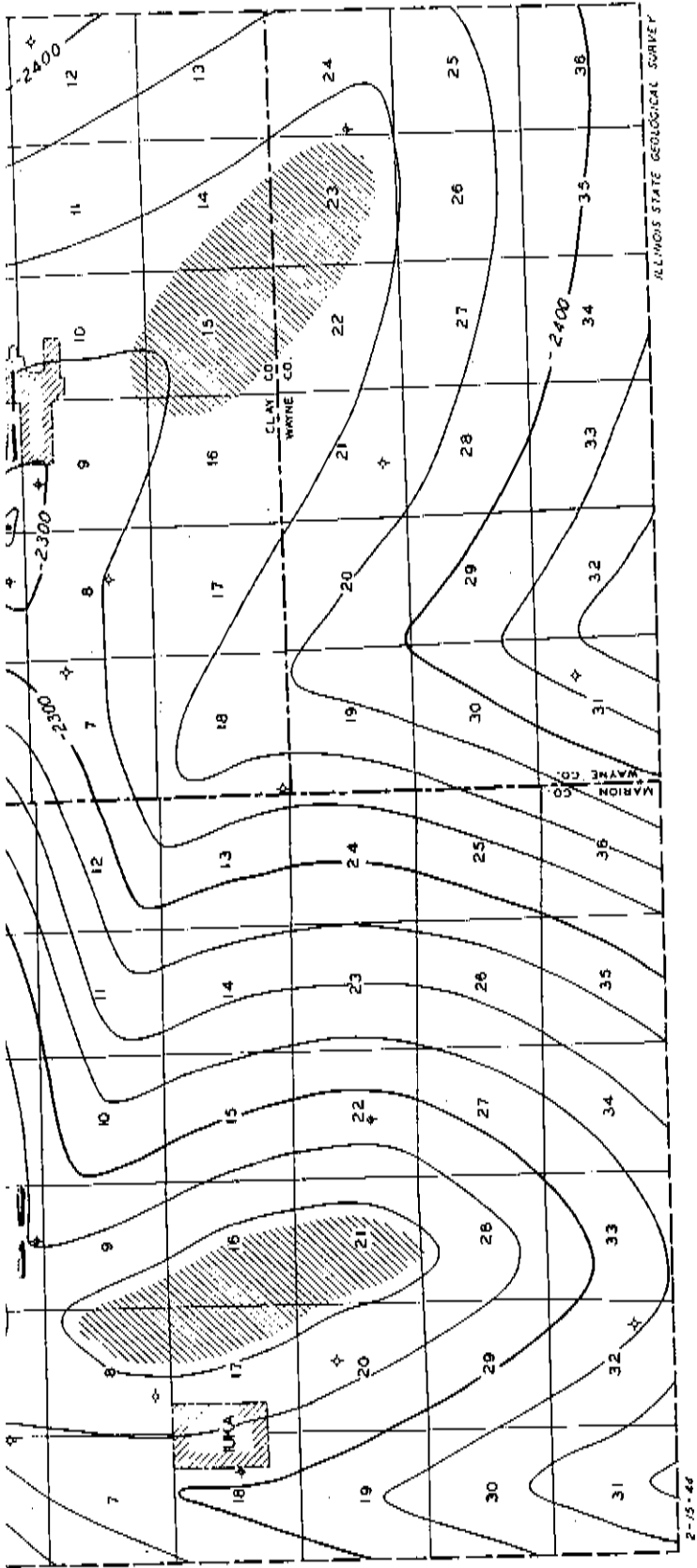
Calculated from the electric log and checked by study of samples by Mr. S. Folk of the State Geological Survey.

	Depth (feet)
Mississippian system	
Chester series	
Top Upper Kinkaid limestone.....	1818
Lower Kinkaid limestone.....	1917
" Menard limestone.....	2118
" Vienna limestone.....	2241
" Tar Springs sandstone.....	2248
" Glen Dean limestone.....	2347
Base Glen Dean limestone.....	2356
Top Golconda limestone.....	2428
" Basal Golconda limestone ("Barlow").....	2525
Base Basal Golconda limestone.....	2538
Top Cypress sandstone.....	2586
" Bethel sandstone.....	2718
" Renault limestone.....	2771
" Aux Vases sandstone.....	2810
Iowa series	
Ste. Genevieve formation	
Top Leviae limestone member.....	2838
" Rosiclare sandstone member.....	2852
" Fredonia limestone member.....	2871
Top Lower Osage sandstone ("Carper").....	4228
" Chouteau limestone.....	4328
" New Albany shale.....	4355
Top New Albany—Devonian transition zone.....	4470
Devonian system	
Top Devonian limestone.....	4485

²Blatchley, R. S. Oil resources of Illinois with special reference to the area outside of the Southeastern fields; Illinois State Geol. Survey Bull. 16, p. 79, 1910.

³Manuscript prepared in February 1944.





LEGEND

- PRODUCING OIL WELL
 - ✦ DRY HOLE
 - ✦ DRY HOLE, SHOW OF OIL
 - ✦ COAL TEST, NOT USED AS DATUM POINT
 - STRUCTURE CONTOUR, INTERVAL 25 FT.
 - ▨ AREA FAVORABLE FOR EXPLORATION
- SCALE
0 1/2 1 3/4 MILE

FIG. 2. Contour map showing the structure of the top of the Levias limestone, datum sea-level. Based mainly on electric logs.

TABLE 1.—Tabulated Data to Accompany Figure 2

COMPANY AND FARM	LOCATION			Production ^a Oil and Water	Oil-Bearing Formation ^a	Elevation of Top of Str. Genevieve
	Sec.	Twp.	Rge.			
Marion County						
Kelley & Finn—Woodbridge 1	SW SW SE	2N	4E	Show?	Penn.	-2177 ^b
Garnier Bros.—J. S. Malivaney 1	SE NE SE	2N	4E	Show	S. G.	-2184
Iuka Oil & Gas Co.—Wimbush 1	W SE SW	2N	4E	D & A		
Bountie Oil & Gas Co.—Dauie's 1	NE NW SE	2N	4E	Show	S. G.	-2192
Kingwood—McGuire 1	C NW SW NE	2N	4E	D & A		-2166
National Petroleum Co.—Lindley 1	C E NE SW	2N	4E	Show	S. G.	-2187
Arrow Drilling Co.—Stonecipher 1	C SW NE SE	2N	4E	D & A		-2223
Seaboard Oil Co. of Dela.—F. Miller 1	C SW SW NW	3N	4E	Show	S. G.	-1839
National Assoc. Pet. Co.—Carter 1	C SW NW SW	3N	4E	Show	S. G.	-1852
Heenan & Coe—Milliken 1	C NE NW NW	3N	4E	Shows	S. G.	-1863
Seaboard Oil Co. of Dela.—N. G. Kniseley 1	C NE SE SE	3N	4E	D & A		-1931
Ohio Oil Co.—Henninger 1	C SW SE SE	3N	4E	D & A		-2061 ^d
C. C. Nye—H. Long 1	C W NW NW	27	3N	Show	S. G.	-2000
Helmerich & Payne—Stephens 1	C SW SW SW	35	3N	Shows	Cyp., Beth., A. V.	-2093
Clay County						
Carter Oil Co.—A. M. Keller 1	W SW SW	4	2N	44P & 2	A. V.	-2272
Carter Oil Co.—I. Walker 1	C NE NE	4	2N	Show	S. G.	-2345
Northern Ordnance, Inc.—J. Sapp 1	C SW SE SE	5	2N	Shows	A. V., Carp., Dev.	-2296
Robinson et al.—Bryant 1	C NE SE NE	7	2N	D & A		-2314
Delk Investment Co.—A. Newman 1	C SW NW SE	8	2N	D & A		-2327
Carter Oil Co.—Campbell 1	C NE NW	9	2N	Show	A. V.	-2296
Sinclair-Wyoming Oil Co.—Rose 1	C SW NE NE	12	2N	D & A		-2407
Gault—Young 1	C SW SW SW	18	2N	D & A		-2334
Benedum & Trees—Anderson 1	C SE SE NW	15	3N	D & A		-2361*
Myers & Nelson—Newton 1	C NE SW SE	18	3N	D & A		-2337
J. Myers—Hendy 1	C SW SW NE	24	3N	Shows	Beth., A. V., S. G.	-2353
Bayer—Allison 1	C SE SE SE	25	3N	Shows	Beth., S. G.	-2307
Lain Oil & Gas Co.—Haynes & McConnell 1	C SW NE NE	25	3N	Shows	Beth., A. V., S. G.	-2346
Stewart et al.—Walker Heirs 1	C W SW SW	27	3N	D & A		-2384
Gordon & Robinson—Cannon 1	C NW SE SE	32	3N	D & A		-2360
Wayne County						
Benedum & Trees—Nugent & Ross 1	C NE SE SW	21	2N	D & A		-2370
Gerson—Leppo 1	C W NW SW	24	2N	Shows	P. C., A. V., S. G.	-2367
Carter et al.—Fathree Comm. 1	C NE SW NE	31	2N	D & A		-2434

* Abbreviations:
 D & A—Dry and abandoned
 P—Barrels of oil pumped
 Penn.—Pennsylvanian
 Cyp.—Cypress sandstone
 Beth.—Bethel sandstone
 P. C.—Pain Creek (Stray) sandstone
 A. V.—Ava bases sandstone
 S. G.—Sec. Genevieve limestone
 Carp.—Carpier sandstone
 Dev.—Devonian limestone

^a Estimated; T. D., 1780'
^b T. D., 587'
^c Estimated; T. D., 2213'
^d Estimated; T. D., 2076'