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CONTENTS

	PAGE
Oil possibilities of the Alexis quadrangle, Mercer and Warren counties, Illinois	1
Summary of oil field operations in Illinois during the first quarter of 1927....	8

OIL POSSIBILITIES OF THE ALEXIS QUADRANGLE,
MERCER AND WARREN COUNTIES, ILLINOIS

By Harold R. Wanless

INTRODUCTION

Following the policy of the State Geological Survey, the present paper summarizes the results of geological studies in the Alexis quadrangle which may be of interest to the oil industry. The Alexis quadrangle is situated in Mercer and Warren counties. Figure 1 shows its location and the location of the Colmar-Plymouth oil field, the nearest oil-producing area.

GENERAL GEOLOGIC RELATIONS

The Alexis quadrangle is situated near the northwestern margin of the Illinois coal field and all of it, except the southwestern portion, is underlain by rocks of the Pennsylvanian system whose thickness varies from that of a thin layer to 200 feet and which rest unconformably on the Kinderhook shale of the Mississippian system in the southern part of the area and on the Sweetland Creek shale of the Devonian system in the northern part. In the southwestern part of the quadrangle there is one limited outcrop of the Burlington limestone and a considerable area in which the Kinderhook shale is near the surface. In the west-central part of the area the Sweetland Creek shale seems to be the youngest consolidated formation, but it is everywhere deeply covered by Pleistocene deposits. Pleistocene deposits are everywhere present; in some places their thickness is negligible, but in others it is as much as 195 feet.

STRUCTURAL GEOLOGY

Structure contour maps were prepared on the top of the Rock Island (No. 1) coal and the Colchester (No. 2) coal, on the basis of outcrops, mine

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records, coal test borings, and wells penetrating the coal. These maps are not here reproduced, as the areas in which records of the coal were obtained are restricted to the northeastern and southeastern portions of the quadrangle.

The structure contour map shown in figure 2 is based on the logs of 70 farm and village wells which penetrate a water-bearing zone, situated at the base of the Devonian (Cedar Valley) limestone, or at the top of the Silurian (Niagaran) dolomite. This zone has yielded water in all wells which were drilled to its level. Its depth ranges from 310 to 528 feet in the records now available, and its elevation above sea level from 165 to 386 feet.

The surface elevations of the wells were determined by telescopic level and plane table. Most of the depths of wells were obtained from both the owners and the drillers. The depth of the wells is used in preference to the base of the Sweetland Creek shale, a horizon which was passed through in all these wells, because in many logs only the total depth was accurately recorded.

The stratigraphic horizon on which this map is based is a porous zone which apparently follows the line of contact between the Silurian and Devonian limestones. Some of the irregularities in its surface may be the result of erosion after the deposition of the Niagaran and before the deposition of the Cedar Valley, but the relief of such an erosional surface would probably be slight.

Since only three of the 70 records are located in the southeastern quarter of the quadrangle, the structure in that part of the area is extremely generalized.

The more pronounced structures indicated by the map include (a) an anticlinal nose pitching toward the southwest, which seems to flatten out near the village of Little York, secs. 20 and 21, T. 12 N., R. 3 W.. (b) an anticlinal nose pitching south or south-southwest, which appears to flatten in secs. 19 and 20, T. 12 N., R. 2 W.. (c) a southeastward-pitching anticlinal nose which appears to flatten in secs. 13 and 24, T. 14 N., R. 3 W., and secs. 18 and 19, T. 14 N., R. 2 W. A syncline pitching eastward is indicated in records from the Rock Island and Colchester coals. Its axis passes through secs. 19, 20, and 21, T. 12 N., R. 1 W. There are no records of the pre-Pennsylvanian structure of this area, but it is probable that a syncline with somewhat higher dips would be found in the pre-Pennsylvanian strata if they were tested.

PREVIOUS TESTING AND DEEP DRILLING

Four deep oil tests have been drilled up to the present. Three of these were carried into the Galena (Ordovician) dolomite and the fourth through this formation and the St. Peter sandstone.

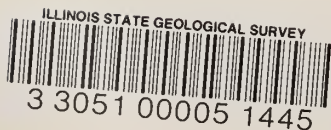




FIG. 1. Index map of Illinois showing location of Alexis quadrangle and of the Colmar-Plymouth oil field.

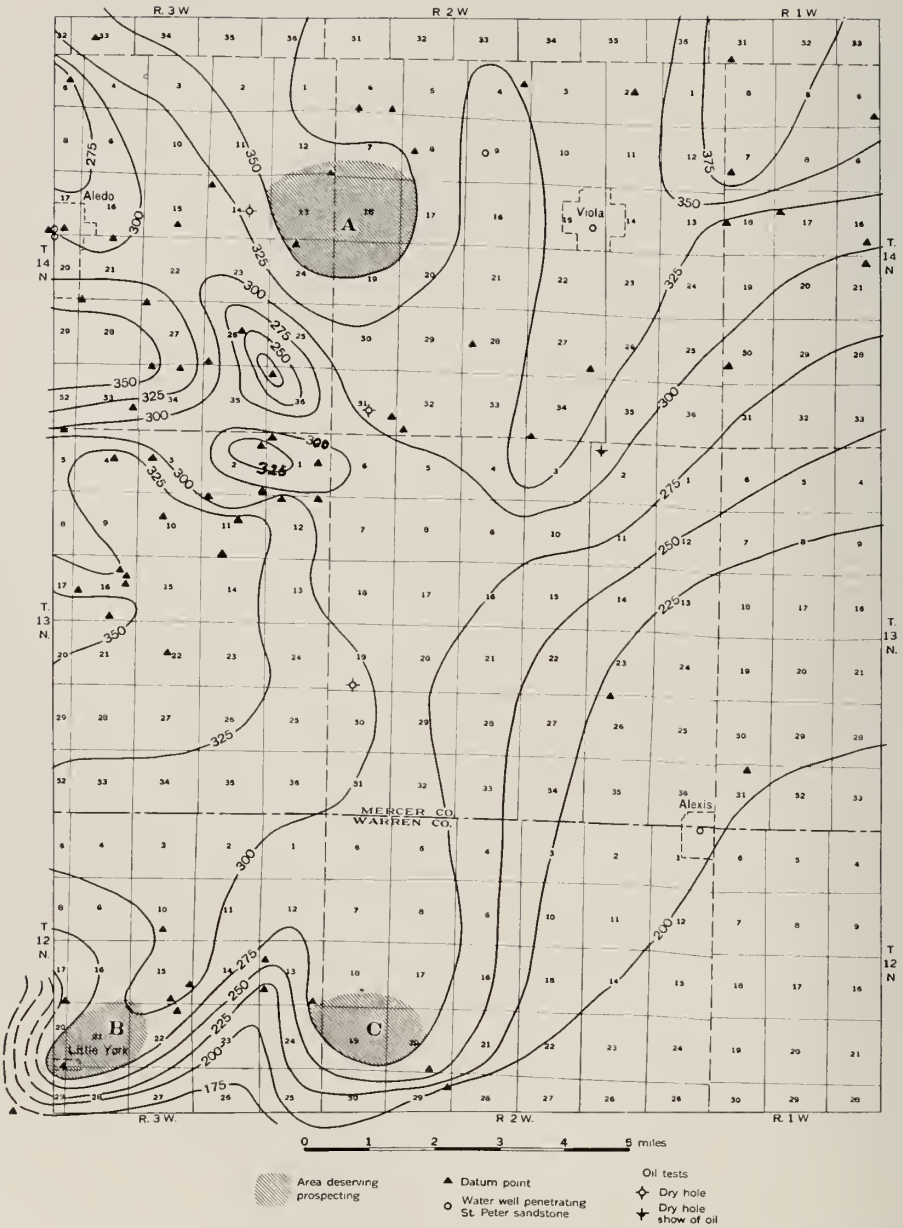


FIG. 2. Structure map of the Alexis quadrangle. Key horizon, Silurian-Devonian water-bearing zone. (By H. R. Wanless, Illinois State Geological Survey.)

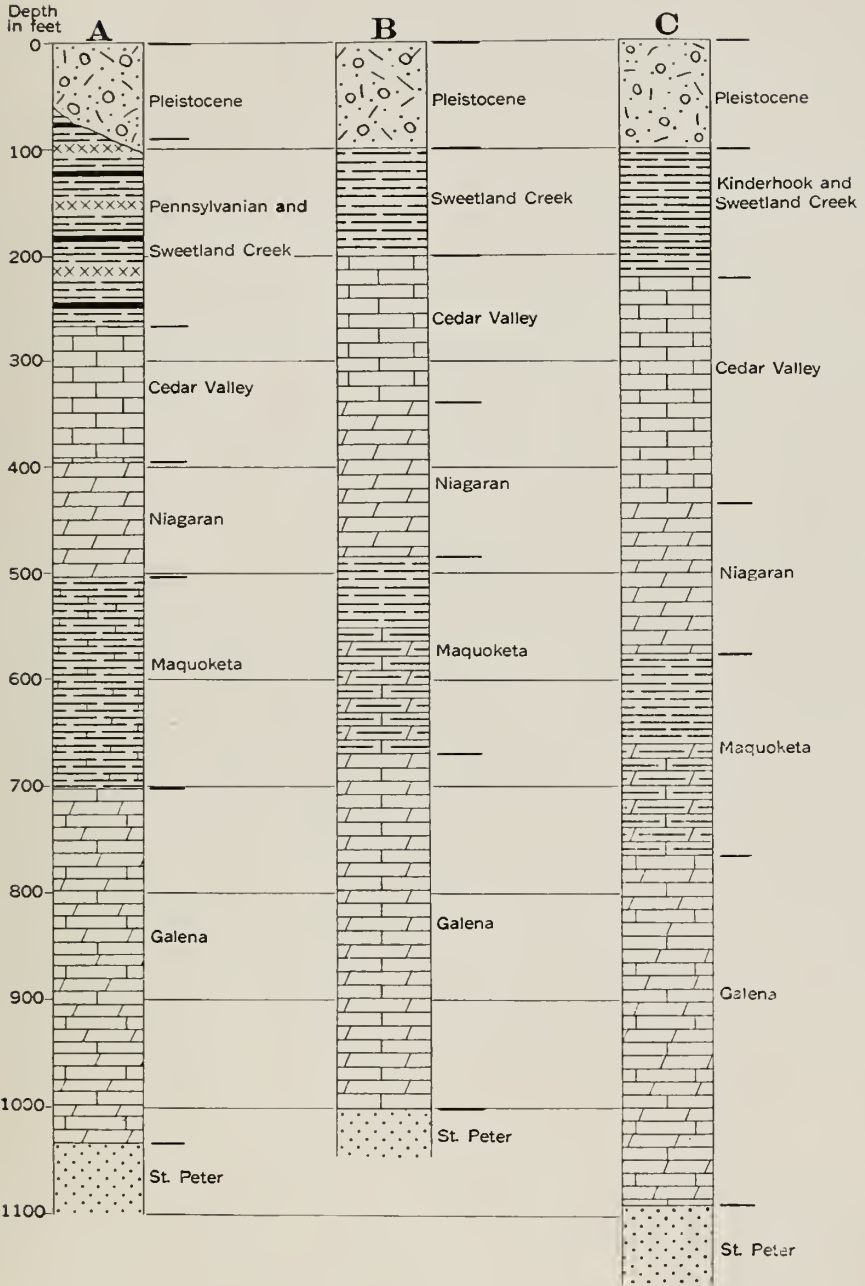


FIG. 3. Generalized sections showing succession of strata in areas A, B, and C, figure 2. (By H. R. Wanless, Illinois State Geological Survey.)

One test on the farm of H. E. Robbins, NW. $\frac{1}{4}$ NW. $\frac{1}{4}$ sec. 2, T. 13 N., R. 2 W., was sunk to a depth of 1300 feet into the Shakopee dolomite, 20 feet below the base of the St. Peter sandstone. The surface elevation is 733 feet. According to Mr. B. McLaughlin of Viola, two oil shows were encountered. The first was at a depth of about 800 feet in a sand 11 feet thick, which would be approximately at the top of the Galena dolomite below the Maquoketa shale. The other was at a depth of nearly 1200 feet, near the top of the St. Peter sandstone.

A test on the farm of Will Laird, NW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec 14, T. 14 N., R. 3. W., surface elevation 753 feet, was sunk to 912 feet and finished near the middle of the Galena dolomite. No shows of oil were reported except at a depth of 95 feet at the top of the Pennsylvanian. The oily substance found here may be the product of organic decay of the surface soil material under the glacial drift, and no significance is attached to this report.

A test situated in the alluvial plain of North Henderson Creek, on the farm of Elder Smith, near the southern margin of the SE. $\frac{1}{4}$ SW. $\frac{1}{4}$ sec. 19, T. 13 N., R. 2 W., surface elevation 628 feet, was sunk to a depth of 885 feet, probably ending near the base of the Galena dolomite. Samples at intervals of 5 feet from a depth of 200 feet to the bottom of the well were examined by the State Geological Survey. No shows of oil from this well were reported to the writer.

A test situated on the Cook farm, near the SW. corner NW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 31, T. 14 N., R. 2 W., was sunk to a depth of 806 feet, probably ending near the top of the Galena dolomite. Neither details of the log nor reports regarding shows of oil were obtained for this test.

Other wells which have entered the St. Peter sandstone, are the village well of Alexis, NE. $\frac{1}{4}$ NE. $\frac{1}{4}$ sec. 1, T. 12 N., R. 2 W., the village well of Viola which is situated in the NE. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 15, T. 14 N., R. 2 W., two city wells of Aledo, SW. $\frac{1}{4}$ SE. $\frac{1}{4}$ sec. 17, T. 14 N., R. 3 W., and a water well drilled by the Alden Coal Company at Wanlock near the center of the N. line SW. $\frac{1}{4}$ sec. 9, T. 14 N., R. 2 W. City well No. 1, Aledo, was drilled to a depth of 3,165 feet, ending about 700 feet below the top of the Mt. Simon sandstone (Cambrian).

POSSIBLE OIL-BEARING HORIZONS

The Pennsylvanian, Mississippian, and Devonian strata have been penetrated in so many water well borings in various parts of the quadrangle that the absence of any shows of oil or salt water may be taken as evidence that no oil may be expected in these series of rocks. Analyses of water from the Silurian-Devonian water horizons from the village well of Little York and from four farm wells in different parts of the quadrangle show water of low salinity. In view of this fact, this porous horizon would not be ex-

pected to yield oil. The Hoing sand, which is the producing sand in the Colmar-Plymouth field in McDonough County, is situated at the base of the Silurian system. No sand or other porous horizon is reported in the logs of wells penetrating the Maquoketa (Ordovician) shale below the Niagaran (Silurian) dolomite. Massive dolomite directly overlies shale in all wells of which logs are now available. If there are any porous horizons in the Niagaran or Maquoketa formations they are probably isolated pockets which would yield salty water.

The Galena dolomite presents the most favorable possibilities for the collection of oil in commercial quantities. Salty water is often encountered in drillings which pass through this formation, and shows of oil have been reported in various parts of it. Porous zones in it have produced oil in the Waterloo field, Monroe County. To test a structure adequately, drilling should be carried down to the top of the St. Peter sandstone which would be encountered at depths ranging from 1000 to 1300 feet in this quadrangle.

RECOMMENDATIONS FOR TESTING

Each of the anticlinal noses mentioned above is outlined on very incomplete data. Therefore two or more shallow tests might be justified to give a better outline of the structure before deeper drilling is attempted. If such shallow tests are made, they should be carried to the contact of the Sweetland Creek shale and the top of the Devonian (Cedar Valley) limestone. This is the shallowest pre-Pennsylvanian guide horizon which will be encountered at all points in the quadrangle. Depths to it should range from about 200 to 350 feet.

None of the four oil tests so far made, and none of the deep water wells appear to be located favorably for testing any of the structures. Areas which are considered most favorable for testing on the basis of data at present available are indicated on the map (fig. 2) by shading. The succession of strata in each of these areas is shown in figure 3. Of the three areas indicated, that in the vicinity of Little York, sec. 21, T. 12 N., R. 3 W., appears most favorable. That in secs. 19 and 20, T. 12 N., R. 2 W., may be equally promising, but its structure is outlined by only two datum points.

Test drilling through the Galena dolomite in these areas is recommended on the basis of the considerations mentioned above. It should be emphasized, however, that as yet no commercial yields of oil have been obtained from the Galena (or "Trenton") in northern Illinois and that the nearest "Trenton" oil field, the Waterloo field in Monroe County, is approximately 200 miles south of the Alexis quadrangle.

OIL FIELD OPERATIONS IN ILLINOIS DURING THE FIRST QUARTER OF 1927

By C. R. Clark and A. H. Bell

For the first quarter of 1927 the southeastern oil fields have shown the most activity in oil development in Illinois. In this territory Wabash County leads, both in total number of completions and in the number of new producers developed. Lawrence and Crawford counties follow rather closely in number of tests, but were of considerably less importance in the development of new production. Some activity was shown in Clark County where there were five completions.

The only other area in which there has been noticeable activity is in the western part of the State near Jacksonville, Morgan County. Here there were five completions.

The rather high percentage of producing wells drilled in Wabash and Lawrence counties is due, no doubt, to the locating of tests near proven production. Nearly all the tests were either on inside locations or on locations near producing wells.

Drilling in the various fields has been greatly impeded by poor weather and road conditions, and to some extent by the sharp reduction in the price of crude petroleum. With the approach of warmer weather and better operating conditions greater activity may be expected, especially in Wabash County where an attempt will be made to extend the good production found on the J. C. Sparks farm north of Allendale and on the A. B. Keen farm east of Friendsville.

The discovery of a good gas sand at a depth of 435 feet on the Willerton farm, east of Jacksonville, Morgan County, may lead to further testing in that locality.

In other parts of the State the usual amount of testing and wildcat drilling may be expected.

Table 1 summarizes operations during the period of three months ending March 31, 1927.

TABLE I.—Summary of oil field operations in Illinois, January 1 to March 31, 1927

Location		Company	Farm and well No.	Production		Remarks	
				Bbls.	Depth <i>Feet</i>		
County	Township	Section	Southeastern Field				
Clark	Casey	23	D. C. Davis No. 22	A. F. Lennex	4	602	
		26	W. C. McBride, Inc., No. 27	James Rush	37	600	
		36	W. C. Turner, et al, No. 3	Wheeler Baker	40	1598	Niagara lime
	Johnson	13	W. C. McBride, Inc., No. 1	H. V. Blakeman	.....	.....
		13	W. C. McBride, Inc., No. 1	Norman Bennett	.....	.....
Coles	Ashmore	2	Shrider, et al, No. 1	L. Houghton	Dry	.....
		2	Shrider, et al, No. 2	L. Houghton	.....	.....
Crawford	Honey Creek	15	Craig, Lowrie, et al	Randolph Weger No. 12	8	1040	
		17	Barber, et al	H. T. Southen	Dry	.....	Gas
		18	H. D. Barker, et al, No. 1	J. S. Baker	20	940	
		8	Hartman, Sargeant, et al	J. H. Buzzard No. 1	Dry	1247	
		23	O. C. Sutherland	P. A. Matheny	2	445	Casey sand
		1	W. C. Kennedy Co., No. 14	Asbery Pope	Dry	.....
		12	Abbot, et al, No. 5	L. H. Highsmith	.....	.....
		13	H. D. Barker, et al	J. S. Baker	.....	.....
		26	Carns, et al, No. 7	Ira Fenehen	.....	.....
		27	Ohio Oil Co., No. 20	W. L. Hughes	.....	.....
Lawrence	Bond	9	American Oil Development Co.	L. N. Tohill No. 6	6	976	
		29	Dill, et al, No. 1	J. H. Armstrong	.....	.....
		29	Thos. Flynn, et al, No. 10	J. P. Sager	10	968	
		30	Ohio Oil Co., No. 8	Charles Gillin	3	885	
	Bridgeport	17	Snowden and McSweeney, C. B.	O'Donnel	.....	.....	Gas
			No. 44				

TABLE 1.—Summary of oil field operations in Illinois, January 1 to March 31, 1927—Continued

Location			Company	Farm and well No.	Production		Remarks		
County	Township	Section			Bbls.	Depth Feet			
Wabash	Friendsville	20	Big Four Oil Co., No. 3	Ellen Lutz	10	1389			
		32	Ohio Oil Co.	J. R. Middaugh	Dry	5190	Drilled to St. Peter sandstone		
		1	Kewanee Oil Co., No. 24	J. E. Lingenfelter		
		11	Ohio Oil Co., No. 18	A. B. Buchanan	30	1290	Plugged back to sand at 614		
		20	Treat-Hays Oil Co.	John Potts	20	1878	McClosky sand		
		21	Big Four Oil Co.	L. M. Seed No. 19		
		21	Ohio Oil Co., No. 8	Ellen Lutz	12	1372	Buchanan sand		
		21	Ohio Oil Co., No. 9	Ellen Lutz	4	1390	Buchanan sand		
		36	Ohio Oil Co., No. 9	C. M. Irvine	10	1670	Kirkwood and Tracy sands		
		36	A. Brunner, et al., No. 12	W. H. Dinning	25	1627	Tracy sand		
		Wabash	Friendsville	5	Wm. Bell, et al	H. C. Yelton No. 4	5	1565	
				19	Miller and Lengleson	A. B. Keen No. 1	70	1630	
				19	Woods Farm Oil Co.	J. O. Woods No. 4	Dry	1650	
1	J. S. Young, Jr., et al			Alka Heirs No. 4	75	1467			
1	J. S. Young, Jr., et al			W. W. Barney No. 1	30	1549	Deepened from 1391		
2	J. S. Young, Jr., et al			Jesse Cisel No. 2	30	1450			
Wabash	Friendsville	2	Breen Oil Co.	John Breen No. 5	30	1407			
		2	Breen Oil Co.	John Breen No. 6	70	1395			
		6	Wirebach, Young, et al	Catherine Keyser No. 6	125	1354			
		6	Wirebach, Young, et al	Catherine Keyser No. 7	Dry	1570			

TABLE 1.—Summary of oil field operations in Illinois, January 1 to March 31, 1927.—Concluded

County	Location		Company	Farm and well No.	Production		Remarks
	Township	Section			Ebbs.	Depth <i>feet</i>	
St. Clair	T. 1 N., W.	R. 8 24	E. S. Mason, et al	.....	.....	.....	Drilling
Tazewell	T. 26 N., W.	R. 3 2	J. L. Palmer	.....	.....	.....	Drilling