

Oil production in 1958 declined 8.5% and gas increased 65.1% from the previous year. Production reported for 1958 was 9,308,018 barrels of oil and 10,964,378 MCF of gas. Production reported for 1957 was 10,168,602 barrels of oil and 6,639,813 MCF of gas. All production figures are from the records of the Michigan Department of Revenue.

EXPLORATION

The exploratory wells drilled during the year resulted in five new oil fields, two new gas fields, five extensions, and six new pools for a 11.8% success ratio. Additional encouragement for the year was provided by the discovery of five oil pools and one gas pool extension through the drilling or reworking of development wells. These wells have not been included in the exploratory statistics. Subsurface geology continued to be the major tool of exploration. However, a substantial number of exploratory tests were drilled as a result of gravity surveys.

Forty-four exploratory wells were classified as important deep tests in 1958. A formational breakdown of these tests in ascending order is as follows: six the Prairie du Chien, six the Trenton-Black River, four the Cincinnati, ten the Clinton, nine the Niagaran, four the Salina, one the Bass Island, one the Bois Blanc, one the Sylvania, and two the lower Detroit River. The deep tests resulted in five discoveries, or a 3.3% success ratio.

Two geological test permits were issued in 1958. Six such permits were issued in 1957.

Geophysical exploration was conducted throughout the year. All reported work was in the nature of gravity surveys. Southwestern and southern Michigan received the greatest amount of attention. However, surveys were also conducted in St. Clair County and surrounding area.

Undeveloped acreage under lease at the end of the year as reported by several companies increased substantially from the previous year. Twelve major companies and two independents reported 1,078,511 acres under lease at the end of 1958. These same companies reported 843,072 undeveloped acres under lease in December of 1957. Most of the increase in acreage can be attributed to southern Michigan.

Subsurface geology as in the past was the most efficient tool of exploration in Michigan during 1958. All but two of the recorded discoveries were the result of subsurface geology. These two tests: Bernhardt-Kain #1, Section 30, T.7S., R.6E., Monroe County, and Devine-Kok #1, Section 29, T.5N., R.14W., Ottawa County, were the result of a combination of gravity and subsurface geology.

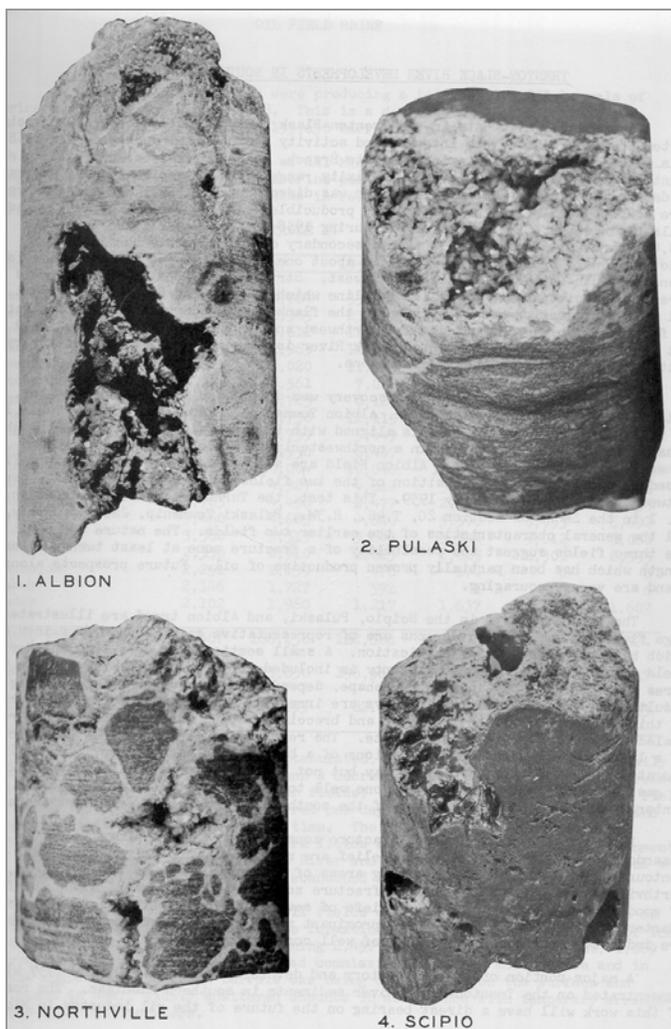
PROSPECTS FOR 1959

Exploration and development well activity is expected to increase during 1959. A large part of this increase will be in southern Michigan. Current and past successes in the Western, Southwestern, and Eastern Districts continue to stimulate interest in those areas. The Basin District will probably maintain the same level of activity as in the past few years.

[Representative Cores of the Trenton-Black River Oil Field in Southern Michigan]

Explanation for the Core Photographs
Illustrated on Page Five

1. Albion: Carter Oil Co. - Rosenau #1, NW SW NW, Sec, 23, T.3S., R.4W., Albion Township, Calhoun County
Producing zone - Trenton Formation, approx. depth of sample 3968
2. Pulaski: Sun Oil Co. - Blair #1, NW NE SW, Sec. 20, T.4S., R.3W., Pulaski Township, Jackson County
Producing zone - Trenton Formation, approx. depth of sample 3927
4. Scipio: Aurora & McClure -. Rowe #A-1, NW SW SE, Sec. 3, T.5S., R.3W., Scipio Township, Hillsdale County
Producing zone - Trenton Formation, approx. depth of sample 3940
3. Northville: Taggart - Newton #2, NE NW SE, Sec, 2, T.1S., R.7E., Salem Township, Washtenaw County
Producing zone - Trenton Formation, approx, depth of sample 4151



TRENTON-BLACK RIVER DEVELOPMENTS IN SOUTHERN MICHIGAN

Favorable developments in the Trenton-Black River Formation of the Ordovician System created considerable interest and activity in the oil industry during 1958. This interest was confined principally to Branch, Calhoun, Jackson, and Hillsdale counties (see inside front cover). Activity ranged from intensive leasing programs to development in the Scipio Field which was discovered in 1957. Nineteen new wells were completed bringing the total to 25 producible wells at the end of 1958. These wells produced 527,253 barrels of oil during 1958 for an accumulative total of 613,484 barrels. Production is from a secondary dolomite and is confined to a fracture zone. Presently, the field is about one half mile wide and two miles long, trending south-southeast to north-northwest. Structurally, the fracture zone is directly associated with a shallow syncline which plunges to the north-northwest. All of the production has been in or on the flanks of the depression. Approximately 30 feet of relief is indicated. The northwest and southeast limits of the field have not been established. The Trenton-Black River is principally

limestone with very little porosity outside the fracture zone.

Another Trenton-Black River discovery was drilled in the area in December, 1958. This test was located in Section 22, Albion Township, Calhoun County (see Table 17). It is significant that the well is aligned with the general Scipio trend although located some twelve miles away in a northwesterly direction. The structure and general characteristics of the Albion Field are similar to those in the Scipio Field. Based on the lineation and position of the two fields, a successful test was completed between these fields in early 1959. This test, the Turner Petroleum Corporation, Blair No. 1 in the SE NW SW Section 20, T.4S., R.3W., Pulaski Township, Jackson County, has all the general characteristics of the earlier two fields. The nature and position of the three fields suggest the possibility of a fracture zone at least twenty miles in length which has been partially proven productive of oil. Future prospects along this trend are very encouraging.

The producing pays in the Scipio, Pulaski, and Albion trend are illustrated on page five. All of the photographs are of representative samples from four-inch cores which have been reduced for publication. A small section of a core from the Northville Field in northeastern Washtenaw County is included for comparison. The vugs in the cores vary considerably in size and shape, depending on the degree of fracturing and resulting solution activity. The pays are irregular as can be expected in reservoirs of this type. Some of the fractured and brecciated zones have been completely re-sealed with white crystalline dolomite. The reservoir energy is furnished principally by a large gas cap with some indications of a bottom hole water drive. The wells are prorated at 150 barrels of oil per day but not allowed to produce in excess of 200 MCF of gas per day. Present spacing is one well to 20 acres with the wells located in the center of the northwest and center of the southeast ten acres of each forty-acre tract.

Exploration for the type of fracture zone trend discussed above is costly and hazardous. The low differences in relief are not readily indicated by regional contours. In other Trenton producing areas of the state, such as the Deerfield, Northville, and Freedom fields, the fracture zones have been located along the flanks of good vertical structures with reliefs of several hundred feet in less than one-quarter mile. These structures are prominent northwesterly trending features which are indicated with a minimum amount of well control.

A major portion of the exploratory and development activity during 1959 will be concentrated on the Trenton-Black River sediments in southern Michigan. The results of this work will have a direct bearing on the future of the oil industry in Michigan.

OIL FIELD BRINE

Michigan oil fields were producing a total of 179,231 barrels of brine per day at the end of 1958. This is a decrease of 16,399 barrels per day as compared with a total of 195,630 barrels per day at the end of 1957.

Table II is a record of all Michigan oil fields which were producing in excess of 2,000 barrels of brine per day and the percentage, factor of the total produced from these fields in relation to the total daily brine produced in the state.

TABLE II

Field	1958	1957	1956	1955	1954	1953
Coldwater	29,344	33,704	33,256	29,799	26,751	22,601
Reed City	21,785	22,385	23,822	24,907	28,105	30,498
Freeman-Redding	12,247	12,612	11,930	12,734	14,501	17,485
Porter	11,719	11,963	12,292	12,604	12,528	11,966
Deep River	11,321	13,020	11,729	10,538	5,174	4,368
Stony Lake	10,215	8,561	7,062	7,139	5,142	4,466
Pentwater	9,455	8,725	8,129	8,196	6,997	7,473
Fork	6,481	7,758	12,115	16,475	18,632	19,109
Adams, North	5,392	5,759	5,449	5,387	5,278	4,972
Sylvan	4,598	6,950	6,407	4,830	3,960	3,780
Kimball Lake	4,405	10,004	10,040	12,276	12,859	11,543
Winterfield	4,071	4,327	4,612	3,624	3,205	4,416
Clayton	3,763	4,456	2,477	2,390	2,517	2,453
Ewart	3,460	4,685	4,610	5,590	6,035	6,692
Prosper	3,302	3,513	3,644	3,544	3,012	3,060
Vernon	2,530	2,910	2,825	2,825	2,300	2,335
Reynolds	2,251	1,139	478	174	0	0
Huber	2,146	1,727	592	1	0	0
Cedar	2,102	1,960	1,217	1,637	1,616	1,607
Total (19 fields)	150,587	166,158	162,686	164,670	158,612	158,824
State total	179,231	195,630	196,563	202,361	194,078	190,817
Per cent state total	84.02	84.93	82.77	81.37	81.73	83.23

Of the nineteen fields tabulated, five had an increase in the daily amount of brine produced and fourteen a decrease. The most significant increases were in the Stony Lake and Pentwater fields. The Reynolds, Huber and Cedar fields produced in excess of the 2,000 barrel per day production rate during 1958 and appear in this table for the first time. The substantial decrease in brine produced in the Kimball Lake and Fork fields was due to plugging and abandonment of wells. The decrease in the Deep River and Coldwater fields was due to the shut down status of several temporarily abandoned and nonproductive wells.

Operators in Michigan oil fields were returning 176,774 barrels of brine per day to approved subsurface formations. This was 98.63 per cent of the total brine produced. Of the remaining 2,457 barrels, or 1.37 per cent, 1,089 barrels was being used by county road commissions for road maintenance and in lease operations and 1,368 barrels was being disposed of on the surface and released in small widely scattered amounts in accordance with temporary arrangements with the operators.

GENERALIZED COLUMNAR SECTION OF MICHIGAN MICHIGAN GEOLOGICAL SURVEY DIVISION

SYSTEM. SERIES	FORMATION. GROUP	LITHOLOGY	THICKNESS	ECONOMIC PRODUCTS
RECENT				
PLEISTOCENE	GLACIAL DRIFT	SAND, GRAVEL, CLAY, boulders, marl	0-1000	SAND, GRAVEL, PEAT, MARL, FRESH WATER
	"RED-BEDS"	SHALE, CLAY, SANDY SHALE, gypsum		
PENNSYLVANIAN	GRAND RIVER	SANDSTONE, sandy shale	80-95	BUILDING STONE, FRESH WATER
	SAGINAW	SHALE, SANDSTONE, limestone, coal	20-535	SHALE, COAL, FRESH WATER, BRINE, GAS
MISSISSIPPIAN	BAY PORT	LIMESTONE, SANDY OR CHERTY LIMESTONE, SANDSTONE	2-100	LIMESTONE, FRESH WATER
	MICHIGAN	SHALE, gypsum, anhydrite, sandstone	0-500	GYPSSUM
	"MICHIGAN STRAY"	SANDSTONE	0-80	GAS
	MARSHALL	SANDSTONE, sandy shale	100-400	FRESH WATER, BRINE, BUILDING STONE
	COLDWATER	SHALE, sandstone, limestone	500-1100	SHALE, FRESH WATER
	SUNBURY	SHALE	0-140	SHALE, GAS
	BEREA-BEDFORD	SANDSTONE, SHALE	0-325	GAS, OIL
DEVONIAN	ELLSWORTH-ANTRIM	SHALE, limestone	100-950	SHALE, GAS
	TRAVERSE	LIMESTONE, SHALE	100-800	LIMESTONE, OIL, GAS, FRESH WATER
	BELL	SHALE, Limestone	0-80	SHALE
	ROGERS CITY-DUNDEE	LIMESTONE	0-475	LIMESTONE, OIL, GAS, FRESH WATER
	DETROIT RIVER	DOLOMITE, limestone, salt anhydrite	150-1400	LIMESTONE, DOLOMITE, OIL, GAS, SALT, BRINE, FRESH WATER
	SYLVANIA	SANDSTONE, SANDY DOLOMITE	0-550	GLASS SAND, FRESH WATER
	BOIS BLANC	DOLOMITE, CHERTY DOLOMITE	0-1000	DOLOMITE, FRESH WATER
SILURIAN	BASS ISLAND	DOLOMITE	50-570	DOLOMITE, FRESH WATER
	SALINA	SALT, DOLOMITE, Shale, anhydrite	50-4000	SALT, GAS, OIL
	NIAGARAN (Guelph-Lothrop-Engadine) (Manistique-Burnt Bluff) (Coburn)	DOLOMITE, Limestone, shale	150-800	LIMESTONE, DOLOMITE, OIL, GAS, FRESH WATER
ORDOVICIAN	CINCINNATIAN (Richmond) (Mayville-Eden)	SHALE, LIMESTONE	250-800	
	TRENTON-BLACK RIVER	LIMESTONE, DOLOMITE	200-1000	OIL GAS, LIMESTONE, FRESH WATER
	ST PETER	SANDSTONE	0-150	FRESH WATER
OZARKIAN OR CANADIAN	PRAIRIE DU CHIEN	DOLOMITE, Shale	0-410	
	HERMANSVILLE	DOLOMITE, SANDY DOLOMITE, sandstone	15-500	
CAMBRIAN	LAKE SUPERIOR (Munising) (Jacobsville)	SANDSTONE	500-2000	BUILDING STONE, FRESH WATER
ALGONKIAN	KEWENAW (Copper formations)	LAVA FLOWS, conglomerate, shale, sandstone	9800-35000	COPPER, SILVER, ROAD METAL, SEMI-PRECIOUS GEM STONES
	KILLARNEY GRANITE	GRANITE, GNEISS, diorite, syenite		
ARCHEAN	HURONIAN (Iron formations)	SLATES, HEMATITE, SCHIST, QUARTZITE, GRANITE, marble, dolomite	2000+	IRON ORE, ROOFING SLATE, ROAD METAL, GRAPHITE, MARBLE
	LAURENTIAN	SCHIST, GNEISS, GRANITE		ROAD METAL, BUILDING STONE, VERDE ANTIQUE, TALC, GOLD
	KEEWATIN	SCHIST, GREENSTONE, SLATE		ROAD METAL