ANNUAL STATISTICAL SUMMARY

GEOLOGICAL SURVEY, MICHIGAN DEPARTMENT OF CONSERVATION

MICHIGAN'S OIL AND GAS FIELDS, 1963

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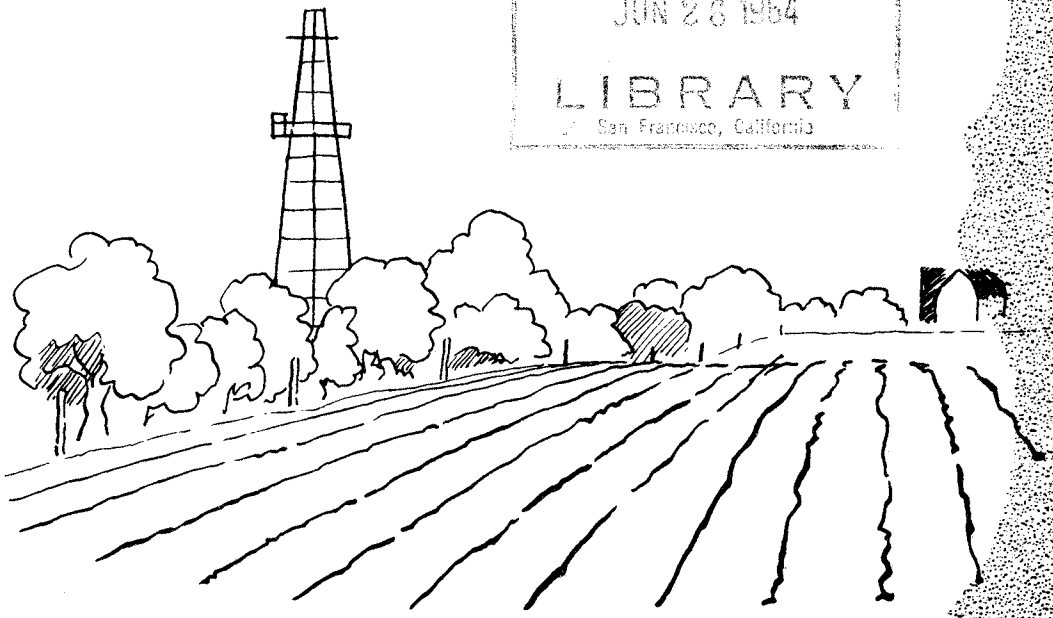

1964

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The STATE GEOLOGICAL SURVEY was one of the very first offices established when Michigan attained statehood in 1837. The First Legislature charged it "...to make an accurate and complete geological survey of this state, which shall be accompanied with proper maps and diagrams, and furnish a full and scientific description of its rocks, soils and minerals...and geologic productions" -- work pursued to this very day.

In 1921 the several state agencies exercising independent jurisdiction over natural resources were combined into a single organization. Thus, the Geological Survey, headed by its chief administrative officer, the State Geologist, became part of the Department of Conservation.

Assisting the Supervisor of Wells (Director of Conservation) in enforcing regulatory practices prescribed by Michigan's oil and gas conservation laws comprises the greater part of the Survey's work. Some assistance is also given the State Public Utilities Commission which regulates the transmission and use of natural gas.

The Survey constitutes a bureau of continuing information and service in the field of earth science. This function is manifested through publications, maps, reference files, and personal consultation -- efforts that aid materially in delineating potential areas of economic mineral deposits, and in achieving understanding of the state's geologic history.

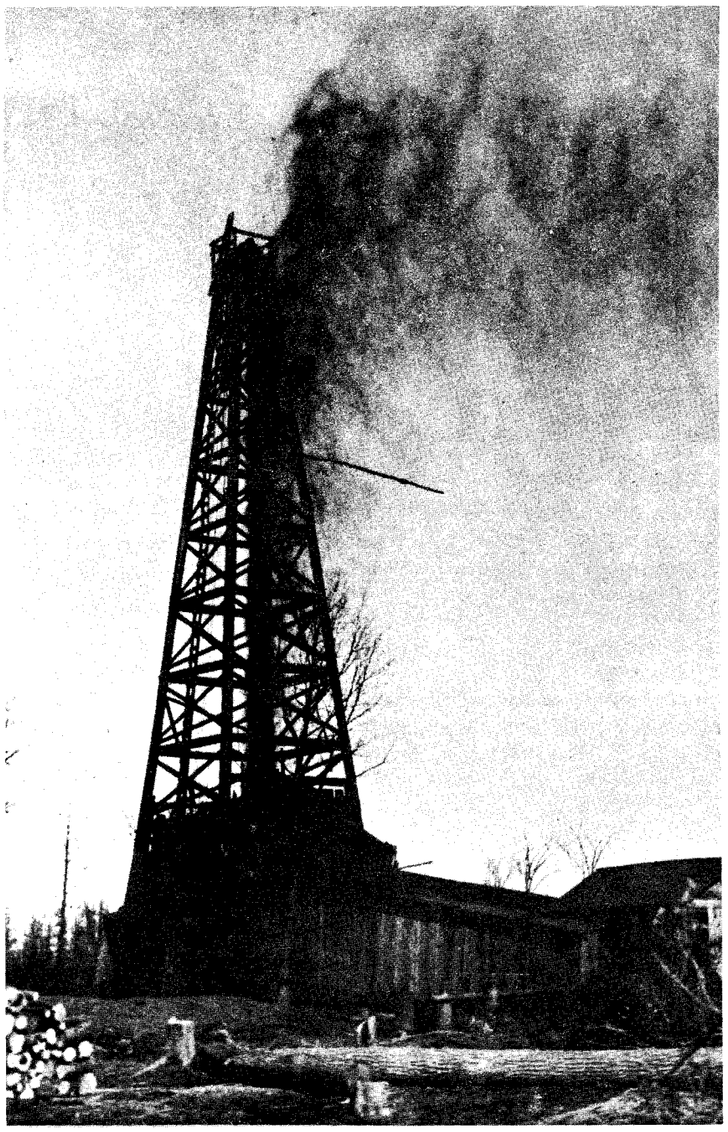
Iron and copper mining properties are appraised annually for general property tax purposes. From time to time, appraisals of other mineral properties are made for the State Tax Commission. Evaluations of mineral venture securities being promoted in the state are prepared upon the request of the State Securities Commission.

Mineral statistics are compiled, in cooperation with the U. S. Bureau of Mines, and published annually along with information on the progress and development of the industry. Also, cooperative assistance is provided in the development of public water supplies and in conducting surface and ground water studies.

The Survey's main offices are on the 4th floor of the Mason Building, one block west of the Capitol. A branch office, serving the Upper Peninsula, is maintained at Escanaba. In addition, district offices for oil and gas regulatory work, are maintained in Lansing, Mt. Pleasant, Plainwell, and Cadillac.

* * * * * *

MICHIGAN'S OIL AND GAS FIELDS, 1963



PORTER OIL FIELD
Midland County
* * * *

Teater and Kirkham's
J. H. Otway No. 1
1933

This well, and others like it, helped make Michigan oil field history. The Otway No. 1 had an initial production of 400 BOPD but after being drilled 35 feet deeper and treated with acid, the oil flow increased to 3,200 barrels in 36 hours.

The area now known as Porter field was delineated by successive oil strikes which were, at times, spectacular. The field covers about 7,200 acres. It has produced 48,087,875 barrels of oil from 529 wells completed from 1933 through subsequent years.

Photo: Courtesy of Norman X. Lyon
Petroleum Publishers, Inc.
Mt. Pleasant, Michigan

GEOLOGICAL SURVEY

ANNUAL STATISTICAL SUMMARY

MICHIGAN'S OIL AND GAS FIELDS, 1963

COMPILED BY

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LANSING
1964

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IN MEMORY

GORDON H. HAUTAU
Born Sept. 26, 1912 Died July 13, 1962

GEOLOGIST AND PETROLEUM ENGINEER
Michigan Geological Survey
1940 - 1962

This report is dedicated to the memory of Gordon H. Hautau whose sincere interest in the field of conservation and oil and gas field geology contributed much to the early development of this publication.

"Hautau," as he was known to his close associates, was a dedicated and energetic worker. A strong advocate of workable and fair oil field practices in the conservation of oil and gas resources, he was a leader who helped put Michigan foremost in this field.

PREFACE

The search for oil and gas in Michigan began about 1860. Exploration was sporadic and haphazard but it did result in the discovery of Michigan's first oil field, Port Huron, St. Clair County, in 1886. Oil production of statewide commercial importance began with the discovery of the Saginaw field in 1925. Since then, several hundred oil and gas accumulations have been found and many more will be discovered. To aid the development of oil and gas resources, the State Geological Survey maintains and publishes data of import to the oil and gas industry.

Short mimeograph reports relating solely to oil and gas exploration and development activities were published by the Survey as early as 1932. By 1946 the short reports had evolved into a publication titled "Summary of Operations, Oil and Gas Fields" appearing annually for the years 1946 through 1962.

The report submitted herewith, though much revised in format, contains essentially the same as former "Summaries of Operations" an extensive compilation of valued information pertaining to Michigan's oil and gas field activities especially as they relate to exploration for new fields and pools, field development, and oil and gas production.

The content is organized into 3 parts. Part I is a general review of the past year's oil and gas exploration activities, drilling, production, and other items of interest. Part II is data on the individual oil and gas fields and related activities. Part III is mostly cumulative records of drilling activities and oil and gas production.

Current oil and gas production figures are provided by the Michigan Department of Revenue. All other statistics are based upon data gathered and maintained by the Geological Survey.

This report is the result of the combined efforts and cooperation of the staff of the Oil and Gas Unit under the general supervision of L. W. Price, and assisted by: R. M. Acker, geologist and head, Regulatory Control; R. E. Ives, geologist and head, Petroleum Geology; and W. G. Smiley, geologist and head, Production and Proration. Also other individuals and companies within the petroleum industry contributed to the fund of information contained herein.

Lansing, Michigan
April 29, 1964

G. D. Ells, Geologist
Petroleum Geology

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GENERALIZED STRATIGRAPHIC CHART

SYSTEM-SERIES	PRINCIPAL ROCK UNITS	LITHOLOGY
PLEISTOCENE	GLACIAL DRIFT	SAND, GRAVEL, CLAY, BOULDERS, MARL
PERMO-CARBONIFEROUS ?	"RED BEDS"	SHALE, CLAY, SANDY SHALE, GYPSUM
PENNSYLVANIAN	GRAND RIVER	SANDSTONE, SANDY SHALE
	* SAGINAW	SHALE, SANDSTONE, COAL, LIMESTONE
MISSISSIPPIAN	BAYPORT	LIMESTONE, SANDY OR CHERTY LIMESTONE, SANDSTONE
	•* MICHIGAN	SHALE, GYPSUM, ANHYDRITE, SANDSTONE
	MARSHALL	SANDSTONE, SANDY SHALE
	COLDWATER	SHALE, SANDSTONE, LIMESTONE
	SUNBURY	SHALE
	•* BEREA-BEDFORD	SANDSTONE, SHALE
	*ELLSWORTH-ANTRIM	SHALE, LIMESTONE
DEVONIAN	•* TRAVERSE	LIMESTONE, SHALE
	•* ROGERS CITY-DUNDEE	LIMESTONE
	•* DETROIT RIVER	DOLOMITE, LIMESTONE, SALT, ANHYDRITE
	SYLVANIA	SANDSTONE, SANDY DOLOMITE
	BOIS BLANC	DOLOMITE, CHERTY DOLOMITE
SILURIAN	BASS ISLANDS	DOLOMITE
	•* SALINA (SEE INSET)	SALT, DOLOMITE, SHALE, ANHYDRITE
	•* NIAGARAN	DOLOMITE, LIMESTONE, SHALE
	CATARACT	SHALE, DOLOMITE
ORDOVICIAN	CINCINNATIAN	SHALE, LIMESTONE
	•* TRENTON-BLACK RIVER	LIMESTONE, DOLOMITE
	ST. PETER	SANDSTONE
	• PRAIRIE DU CHIEN	DOLOMITE, SHALE
CAMBRIAN	TREMPEALEAU MUNISING JACOBSVILLE	SANDSTONE

DIVISIONS OF SALINA

- G UNIT
- F UNIT
- • E UNIT
- D UNIT
- C UNIT
- B EVAPORITE
- • * A-2 CARBONATE
- A-2 EVAPORITE
- • * A-1 CARBONATE
- A-1 EVAPORITE

EXPLANATION

- * GAS PAY
- • OIL PAY

THIS CHART ILLUSTRATES THE GENERAL STRATIGRAPHIC SUCCESSION OF ROCK UNITS IN MICHIGAN. THE GEOLOGIC NAMES COMMITTEE SANCTIONS THE USE OF THIS CHART FOR THIS PUBLICATION. A MORE COMPREHENSIVE AND DETAILED CHART IS IN PREPARATION.

PART I

OIL AND GAS EXPLORATION IN MICHIGAN IN 1963

Following a downward trend which began several years ago, general exploratory and field development activities again declined notably in certain facets of endeavor. Well completions, the amount of drilled footage, and leasing programs showed considerable decline. Gas production continued to rise; oil continued downward. The downward cycle in over-all activities is probably due to the failure to find in recent years big oil fields like the Albion-Scipio Trend, or high volume reefs such as the Belle River Mills gas field in St. Clair County. Also, significant oil strikes in Ohio during the past 2 years have no doubt contributed to a lessened interest in Michigan's possibilities.

* * COMPARATIVE STATISTICS, 1962 and 1963 * *

Drilling Permits. The number of drilling permits for oil or gas well tests, gas storage reservoir wells, and other types of wells drilled under oil and gas permits, dropped slightly from 711 in 1962 to 704 in 1963. The 704 permits issued in 1963 included 83 issued for gas storage reservoir wells and other types. In 1962, 53 permits were issued for this class of well. No permits for Geological Tests were issued during the year.

Well Completions. Exploratory well completions were down about 19 percent from last year. In 1962 there were 294 exploratory well completions as compared with 238 in 1963. In 1963, 18 of the 238 exploratory wells completed during the year resulted in the discovery of new pools, new fields, or extensions to known fields. In 1962 there were only 16 new discoveries from 294 exploratory wells drilled.

Field development well completions declined nearly 10 percent. There were 391 field well completions in 1962 and 353 in 1963. Nearly 54 percent of the field well completions resulted in oil or gas wells.

Comparative figures for exploratory and field wells as shown below do not include deepened wells, gas storage reservoir wells, or other wells not directly related to exploratory or field development activity.

EXPLORATORY AND DEVELOPMENT WELL COMPARISON

Year	Exploratory Wells			Development Wells			Totals
	Oil	Gas	Dry	Oil	Gas	Dry	
1962	8	8	278	140	54	197	685
1963	11	7	220	124	66	163	591

Drilled Footage. The total drilled footage for all classes of wells completed in 1963 amounted to 1,851,996 feet as compared with 1,896,246 feet drilled in 1962. A breakdown of 1962 and 1963 drilled footage shows the following comparisons:

1962 development wells . . .	1,012,711 ft.
1963 development wells . . .	1,064,645 ft.
1962 exploratory wells . . .	883,535 ft.
1963 exploratory wells . . .	698,551 ft.
1962 gas storage wells, etc. .	133,375 ft.
1963 gas storage wells, etc. .	88,800 ft.

* * OIL AND GAS PRODUCTION * *

Oil production continued downward as no significant new oil reserves were found to offset the decline. Production dropped to 15,971,747 barrels as compared with 17,114,303 barrels in 1962. The Albion-Scipio Trend fields produced nearly two-thirds of the state's oil production in 1963.

Gas production (market sales) continued to rise as new reef gas fields in eastern Michigan were developed and put on line. Gas production amounted to 31,895,701 MCF as compared with 27,766,128 MCF produced in 1962. The 1963 figure is the highest ever recorded in Michigan.

Oil and gas production figures by month and by geographic district are shown in the following charts. Gas and oil production by County is shown in Table 2. Production by individual field or pool is found in PART II.

OIL AND GAS PRODUCTION BY MONTH

Month	PRODUCTION	
	Bbls. Oil	MCF Gas
January	1,343,538	3,874,629
February	1,266,203	3,812,219
March	1,348,325	3,180,032
April	1,361,734	2,065,350
May	1,380,900	1,955,861
June	1,302,023	2,021,112
July	1,362,320	2,061,334
August	1,318,968	2,134,421
September	1,296,692	1,995,425
October	1,360,291	2,666,290
November	1,285,140	2,811,860
December	1,345,613	3,317,167
Totals	15,971,747	31,895,701

OIL AND GAS PRODUCTION BY DISTRICT

District	PRODUCTION	
	Bbls. Oil	MCF Gas
Basin	4,279,305	3,631,500
Northern	139,933	680,735
Western	584,866	137,491
Southwestern	3,436,738	4,815,935
Southeastern	7,530,905	22,630,040
Totals	15,971,747	31,895,701

* * LPG EXTRACTION * *

Extraction of LPG products from wet gas processing increased during the past year. The production of LPG's amounted to 54,186,242 gallons as compared with 43,252,973 gallons in 1962. The increase is partly due to extraction of residual LPG from gas delivered via interstate pipe line from southwestern states. Extraction from interstate pipe line gas began at Willow Run plant in December of 1963. The Albion-Scipio Trend and Belle River Mills fields produced, respectively, 30,672,424 gallons and 9,651,898 gallons of the state's total LPG production.

* * OIL AND GAS VALUATION * *

The average price paid per barrel of oil at the wellhead was about $2.85. The total valuation of oil produced in Michigan in 1963 amounted to about $45,497,734.

The price of gas sold at the wellhead averaged about $0.26 per MCF. The total valuation of this product was about $9,891,495 in 1963.

* * CRUDE OIL IMPORTS AND EXPORTS * *

Crude oil imports via inter-state pipe line from western and mid-western states to Michigan refineries amounted to 33,013,238 barrels in 1963 as compared with 36,319,452 barrels in 1962. Refiners also purchased 6,663,971 barrels of Canadian oil, delivered by pipe line from western Canada oil fields, as compared with 7,666,800 barrels in 1962.

In 1963, exports to Indiana refineries amounted to 86,604 barrels as compared with 612,361 barrels in 1962. The oil exported to northern Indiana (Ft. Wayne) refineries was produced in southern and southeastern Michigan fields.

* * LEASING ACTIVITY * *

Leasing activities dropped off sharply from previous years. The majority of companies reporting acreage under lease, reported large decreases. In 1962, twenty-six companies reported a total of 3,639,753 acres under lease at the end of that year. In 1963, twenty-four companies reported a total of 1,829,738 acres under lease at the end of the year. Much of the abandoned leased acreage is located in sparsely drilled counties of the Northern and Southwestern Districts (see oil and gas field map). The amount of state mineral lands under lease decreased from 620,000 acres in 1962 to 420,000 acres in 1963. The amount of land under lease for oil and gas prospecting at the close of 1963 was estimated to be about 2,300,000 acres.

* * GEOPHYSICAL EXPLORATION * *

Exploration for possible oil and gas traps by geophysical methods continued at about the same level as in 1962 and 1963. From two to three gravimeter crews were reported operating in the state most of the year. There were five seismograph crews operating in selected areas for short periods of time. Much of the geophysical surveying was done in eastern and northern parts of the state. Most discoveries (Niagaran reefs) in Eastern Michigan were found by gravimeter, or gravimeter and subsurface study.

* * OIL FIELDS * *

The new oil field discoveries during 1963 increased the number of active oil fields to 179. In addition, 3 new pools or pays were added to older fields. There were 7 fields or pools abandoned during the year. New well completions, including reworks and wells deepened to new pay zones, increased the year-end total of producible wells in the state to 4598. The 4598 producible wells include 364 wells which were shut-down or shut-in but it does not include gas wells or injection wells which produced some oil during the year. The number of producing wells at year's end amounted to 4234. In 1963 there were 155 well abandonments which included pay zones where wells were deepened, recompleted in new pay zones, or converted to injection wells. Data on individual oil fields are found in PART II.

* * GAS FIELDS * *

The addition of 7 new gas fields in 1963 increased the number of producible dry gas fields to 80. The number of gas wells in the 80 fields at the end of 1963 was 367. However, the 367 wells include 203 wells designated as "shut in" or noncommercial. Data on individual gas fields are found in PART II.

* * OIL FIELD BRINE PRODUCTION * *

Oil field brine production amounted to 149,696 barrels per day as compared with 149,425 barrels per day in 1962. There were 15 fields that produced brine in excess of 2,000 barrels per day, and these fields account for nearly 68 percent of the state's daily oil field brine production. The tabulation shown below summarizes brine production data for the 15 fields.

MAJOR BRINE PRODUCING FIELDS

Field	1963	1962	1961
Coldwater	35,701	29,674	29,725
Porter	9,677	9,222	10,643
Deep River	8,800	8,375	9,486
Freeman-Redding	7,630	7,699	8,414
Reed City	6,532	7,920	16,060
Albion-Scipio Trend	6,323	6,321	4,940
Stony Lake	6,371	8,445	7,058
McBain	4,526	2,495	1,496
North Adams	3,664	3,774	3,938
Vernon	2,925	3,320	3,450
Pentwater	2,669	3,088	4,709
Prosper	2,600	4,300	4,125
Reynolds	4,031	3,720	3,617
Fork	2,486	2,500	2,590
Evart	2,410	1,985	2,260
Total	106,345	102,838	112,511
State total	149,696	149,428	157,855

Of the 15 fields shown in the table, 7 had increases totaling 9,676 barrels and 8 had decreases totaling 5,169 barrels. The net increase in brine production for the 15 fields amounts to about 0.03 percent as compared with an increase of about 0.002 percent in brine production on a state-wide basis.

The decrease in brine production in the Reed City field is the result of well rework operations in gas storage-secondary recovery projects now underway. Other decreases are due to abandonment of wells that had reached the economic limits of oil-brine production. The significant increases in brine production were either attempts to maintain oil production by increased total fluid recovery, or by the natural advance of formation water.

Michigan oil well owners and operators continued to return over 98 percent of produced oil field brines to approved subsurface formations. The balance is returned to surface pits, used commercially or used in the maintenance of lease and county roads. Brine production and disposal according to geologic formation is shown in Table 5.

* * EXPLORATION TRENDS * *

In 1962 about 55 percent of the exploratory wells were completed in Silurian or Ordovician formations. In 1963 exploratory tests completed in these same formations accounted for nearly 48 percent of the wildcat well completions. On the other hand, more Devonian tests were made, especially in the Western and Southwestern Districts. Emphasis seemed to be on locating structural traps rather than reefs or fracture reservoirs which have had so much attention in recent years.

In 1963, 6 exploratory wells were drilled into Cambrian formation, 44 into Ordovician, 64 into Silurian, 114 into Devonian, and 10 into Mississippian formation.

The search for new reefs in the St. Clair-Macomb County area should continue, and to a lesser degree, the exploration for fracture traps in Trenton-Black River formations in southern Michigan. Some exploration of Lower Ordovician and of Cambrian formations may get under way on the southern flanks of the Michigan Basin. Possibilities of stratigraphic traps related to unconformities or depositional pinch-out in this region appear favorable. This type of trap is getting much attention in northern Ohio.

* * DEEP TESTS * *

Important deep tests or wildcat wells drilled in 1963 are shown in Table 1. Five of these tests were made in the sparsely drilled Northern District (see oil and gas field map). A good show of oil and gas in an "abnormal" section of Niagaran rock may spark further search for Niagaran reefs in this region.

* * DISCOVERY WELLS * *

There were 11 new field discoveries in 1963, 2 of which are not included in exploratory statistics previously cited. Both these discovery wells resulted from reworking of wells drilled and abandoned in 1962. There were 3 new pools added to known fields. In addition, 6 exploratory wells were completed as extension discoveries to established fields. Details concerning the discovery wells for 1963 are listed on page 6.

A comparative analysis of 1962 and 1963 discoveries according to geologic system is shown in the chart below.

ANALYSIS OF DISCOVERY WELLS BY GEOLOGIC SYSTEM

System	Formation	Number Discoveries 1962	Number Discoveries 1963
Pennsylvanian		None	None
Mississippian	"Michigan Stray"	3	1
	"Berea"	None	None
Devonian	"Traverse Lime"	7	7
	Dundee	None	4
	"Reed City"	1	None
	Detroit River "Sour Zone"	1	None
Silurian	Salina-Niagaran reef		
	Niagaran reef	7	5
Ordovician	Trenton-Black River	None	3
	Prairie du Chien	None	None

Most discovery wells in Eastern Michigan were found with gravimeter, or a combination of gravimeter-subsurface geology. In other parts of the Basin, subsurface geology was the most useful tool for finding new fields.

In 1963, subsurface geology is credited for 9 of the discoveries, gravimeter surveys for 4, combination gravimeter-subsurface geology for 2, and nontechnical methods for the discovery of 5 new fields or pools.

* * 1964 FORECAST * *

The downward trend in drilling activity can be expected to continue through 1964. None of the discoveries in 1963 have the prospects of stimulating any sizeable increase in the development drilling of the new fields. Consequently, the drilling activity will probably depend on the results of exploration programs scheduled for 1964.

The Eastern District will again set the pace in 1964, and probably to a greater degree than in the past year. The Western and Southwestern districts will have limited exploration through the year. The Central Basin District should receive some increase in activity in view of the new discoveries of Traverse and Detroit River pools in Summerfield Township, Clare County. Also, the uncovering of a potential Detroit River oil pool in the South Buckeye field, Gladwin County, should stir some interest.

Cambrian exploration in Ohio and Ontario, Canada, should have some consequences for similar Cambrian exploration in and around the periphery of the Michigan Basin. Only a few wells have penetrated these older (Cambrian) formations. Although nothing of consequence has been found in these rocks in Michigan, the probabilities of oil and gas accumulations are favorable. They can be expected to yield substantial oil and gas in future years.

1963 DISCOVERY WELLS (Sheet 1 of 2)

County	New Field Name, Extension, or Pool	Section Township Range	Operator and Lease	Permit Number	Comp. Date	Total Depth (feet)	Depth to Pay (feet)	Initial Prod.[1] (N)IP=n,(T)IP=t BOPD	MCFGPD	Prod. Form.	Basis for Loc.
* * NEW FIELDS * *											
Arenac	Lincoln, Sec. 31 (Not included in exploratory statistics, reworked 1959 dry hole)	31-18N-4E	Gallaher - State-Lincoln #1	20490	6-5	2,986	2,942	P 10 + 25 wtr^{t}		Dd.	Sub.
Lenawee	Blissfield, Sec. 5 (Not included in exploratory statistics, reworked 1962 dry hole)	5-7S-5E	Bub Oil - Sidel #1	23667	10-19	3,242	2,721		1,650^{t}	Trent.	Nt.
Macomb	Coon Creek	18-4N-14E	Corden - Filipiak #1	24798	6-25	3,093	2,932		20,000^{t}	Sal-Niag.	Grav.
Montcalm	Richland, Sec. 27	27-12N-5W	White - Sherman Sherwood #1	24577	3-27	1,248	1,242		2,120^{n}	Stray	Sub.
Newaygo	White Cloud (Shut down for BDW)	19-14N-12W	Busk & Ryder - Ackerman Ainslee #1	24919	9-16	2,540	2,537	P 16 + 147 wtr^{t}		Trav.	Sub.
Oakland	Leonard	15-5N-11E	Harvey - O'Conner #1	24433	2-12	4,412	4,078		4,000^{t}	Niag.	Grav.
Ottawa	Dennison (Converted to BDW)	21-8N-14W	Cowen - Kramer #1	24571	2-15	1,886	1,873	P 60 + 25 wtr^{t}		Trav.	Grav.
St. Clair	Yankee	25-5N-16E	M.C.G.C., McClure-Hartman - Pung-Robins #1	24924	8-31	2,702	2,536		13,120^{t}	Sal-Niag.	Grav. & Sub.
St. Clair	Alpine	32-6N-15E	Sullivan & Leroux - Rousch #1	25079	11-12	3,357	3,151		7,000^{t}	Niag.	Grav. & Sub.
St. Clair	China Belle	35-4N-16E	Sun Oil - Zobl-Zweng #1	24936	9-12	2,401	2,251		3,280^{t}	Sal-Niag.	Grav. & Sub.
Van Buren	Paw Paw	2-3S-14W	Harris Oil - Serbenski #1	24624	4-9	1,098	1,096	P 8^{t}		Trav.	Sub.

1963 DISCOVERY WELLS Continued (Sheet 2 of 2)

* * NEW POOLS * *											
Clare	Freeman, Sec. 15	15-18N-6W	deCousser - Perkins - deCousser #1	24740	7-13	3,902	3,894	P 5^{t}		Dd.	Sub.
Clare	Cranberry Lake, East (To be deepened)	17-20N-5W	Mammoth Prod. - State-Summerfield #A-1	25121	12-14	3,068	3,057	P 30 + wtr^{n}		Trav.	Sub.
Clare	Cranberry Lake, East	8-20N-5W	Sun Oil - State-Summerfield #A-1	25004	10-15	3,767	3,760	F 83^{n}		Dd.	Sub.
* * EXTENSION DISCOVERIES * *											
Calhoun	Cal-lee	17-1S-5W	Kelly - Velliquette #1	24982	10-21	4,872	4,281	P 10^{t}		Trent.	Nt.
Hillsdale	Scipio	32-5S-2W	Houseknecht Oil - E. Roberts #1	24587	3-20	4,040	3,700	F 110^{n}		Trent.	Nt.
Lenawee	North Morenci	25-8S-2E	Hobson - Terry #1	24742	6-22	627	625		500^{t}	Trav.	Nt.
Mason	Wiley (Converted to BDW)	12-17N-17W	Henry - Englebreche #1	24074	2-3	1,699	1,624	P 4^{n}		Trav.	Sub.
Mecosta	Paris	16-16N-10W	MOCO - Page #1	24481	3-8	2,904	2,893	P 10^{n}		Trav.	Sub.
Missaukee	Riverside	24-21N-7W	Lucas Pet. - Vanderwal #1	24750	6-7	3,934	3,908	F 80^{n}		Dd.	Sub.

[1]Note: (T)IP refers to Initial Potential after acid, sand-fracture, or a combination of methods.
(N)IP refers to Natural Initial Potential or Production.

TABLE 1.-IMPORTANT 1963 DEEP TESTS (SHEET 1 of 2)

County	Operator and Well Name	Section Township Range	Permit Number	Basis for Location	Comp. Date	Total Depth (feet)	System	Formation	Expl. Class	Results
Allegan	Taggart - Deweerd et al #1 (DPT in East Pullman Field)	6-1N-15W	23612	Sub.	9-2	3,038	Ord.	Trent.	DPT	D & A
Barry	Barwick & Hutchinson - Herrington #1	30-1N-7W	24782	Grav.	8-14	3,492	Sil.	Cl.	NFW	D & A
Barry	Simon - Richardson #1	6-3N-10W	24509	Grav.&Nt.	1-10	3,665	Sil.	Cl.	NFW	D & A
Barry	Sun - Afman #1	12-3N-10W	24504	Grav.	1-1	5,000	Ord.	P.D.C.	NFW	D & A
Branch	Perry & Son - Meadows #1 (Show oil in Trenton)	32-7S-5W	23860	Nt.	9-10	3,555	Ord.	P.D.C.	NFW	D & A
Branch	Texaco, Inc. - Walker #1	5-7S-6W	24647	Grav.	4-29	3,600	Camb.	Tremp.	NFW	D & A
Calhoun	R. E. Jones - Beeson #1 (Show oil in Trenton)	26-2S-7W	24508	Nt.	3-7	4,330	Ord.	P.D.C.	NFW	D & A
Calhoun	James O. Kelly - Velliquette #1 (Extension discovery to Cal-Lee Field)	17-1S-5W	24982	Nt.	10-21	4,872	Ord.	B.R.	OP	Oil Well
Cass	H. P. Conrad - Loupee #1	35-6S-16W	24642	Nt.	5-1	1,592	Ord.	Cinn.	NFW	D & A
Cheboygan	Fain Porter - State-Grant #1	21-37N-1E	24904	Grav.	8-22	2,000	Sil.	Niag.	NFW	D & A
Cheboygan	Fain Porter - State-Waverly #1	22-35N-1E	24918	Grav.	9-12	2,876	Sil.	Niag.	NFW	D & A
Clinton	Mask & Markel - Fickies #1 (Show oil in Traverse)	27-7N-1W	24315	Sub.	1-17	3,955	Sil.	Sal.	NFW	D & A
Huron	Texaco, Inc. - C. P. Scott #1	36-16N-12E	24789	Grav.,Seis.	7-14	7,261	Sil.	Cl.	NFW	D & A
Ingham	Pure Oil Co. - Harkness #1	16-2N-2W	24518	Grav.,Seis.	2- 8	6,077	Ord.	P.D.C.	NFW	D & A
Ionia	Ambassador - Burtle #1	4-6N-8W	25025	Grav.,Sub.	11-27	6,140	Ord.	S.P.	NFW	D & A
Ionia	Ambassador - Ten-Cate et al #1	34-7N-8W	24619	Grav.,Sub.	4-10	6,201	Ord.	S.P.	NFW	D & A
Jackson	Rovsek - McFarlane #1	35-3S-3W	24840	Sub.	7-22	5,200	Camb.	Tremp.	NFW	D & A
Kalkaska	Simpson - State-Coldsprings #1 (Good show oil and gas on DST in Niag.)	11-28N-6W	24633	Grav.	5-14	7,219	Sil.	Cl.	NFW	D & A
Kalkaska	Simpson - State-Springfield #1	10-25N-8W	24543	Grav.	3-6	7,785	Sil.	Niag.	NFW	D & A

TABLE 1.-IMPORTANT 1963 DEEP TESTS Continued (SHEET 2 of 2)

Kent	Ambassador - Francisco #1	35-8N-9W	24627	Grav.,Sub.	4-17	6,473	Ord.	Gw.	NFW	D & A
Kent	Ambassador - Ten-Have #1	6-8N-9W	24826	Grav.,Sub.	8-4	6,560	Ord.	Gw.	NFW	D & A
Lenawee	California Co. - Mohr et al #1 (Show oil in Trenton)	30-6S-3E	24515	Grav.	1-14	3,768	Ord.	P.D.C.	NFW	D & A
Lenawee	Hackett - Lipp #A-1 (Plugged back and completed as SIGW in Traverse)	25-8S-1E	24882	Sub.	8-13	3,238	Ord.	P.D.C.	DPT	Gas Well
Livingston	G. W. Strake - Lopez #1 (Show gas and oil and good dolomite section in Trenton)	14-1N-6E	24771	Grav.,Sub.	7-22	5,620	Camb.	Tremp.	NFW	D & A
Manistee	Simpson - Northrup #1	8-24N-13W	24557	Grav.	3-22	7,192	Ord.	S.P.	NFW	D & A
Mason	Sun - Jacobson Unit #3 (DPT in Scottville Field)	14-18N-17W	25053	Sub.	12-3	5,171	Ord.	Cinn.	DPT	D & A
Missaukee	Welch - Workman #1 (DPT in Falmouth Field)	31-22N-6W	24501	Sub.	1-21	5,642	Dev.	Sylv.	DPT	D & A
Oakland	Harvey - O'Conner #1 (Leonard Field Niagaran reef discovery)	15-5N-11E	24433	Grav.	2-12	4,412	Sil.	Niag.	NFW	Gas Well
Oakland	McAlester Fuel - Benson #A-1	34-4N-8E	24516	Grav.	1-13	4,580	Sil.	Cl.	NFW	D & A
Ottawa	Cowen - Heckel-State #1 (Plugged back and completed as Traverse oil well)	21-8N-14W	24606	Grav.,Sub.	4-15	3,202	Sil.	Sal. A-2	DPT	Oil Well
Presque Isle	Fain-Porter - Weide #1	33-33N-7E	24999	Grav.	11-5	5,458	Camb.	"Camb."?	NFW	D & A
Sanilac	Phillips Pet. - Bielke #1	32-12N-16E	24652	Grav.	5-15	4,978	Sil.	Cl.	NFW	D & A
Sanilac	Phillips Pet. - Essenmacher #1	7-11N-16E	24609	Grav.	3-28	5,000	Sil.	Cl.	NFW	D & A
Sanilac	Phillips Pet. - McCarty #1	35-12N-15E	24544	Grav.	3-1	5,212	Sil.	C.H.	NFW	D & A
Sanilac	Phillips Pet. - Mutten #1	32-12N-16E	24490	Grav.	1-31	5,028	Sil.	C.H.	NFW	D & A
Sanilac	Phillips Pet. - Weyeneth #1	34-13N-15E	24730	Grav.	6-5	5,425	Sil.	Cl.	NFW	D & A
St. Clair	Goll-Graves & Mechling, Inc. - Shumrack #1	6-6N-16E	24722	Nt.	9-10	5,391	Camb.	Dres.	NFW	D & A
Van Buren	Moncrief - Tomcola et al #1	24-2S-15W	25195	Sub.	12-23	2,130	Ord.	Cinn.	NFW	D & A
Washtenaw	Good & Good - Schowacko GG #1	16-4S-5E	24714	Grav.	9-23	3,856	Camb.	"Camb."?	NFW	D & A

TABLE 2 -- DRILLING PERMITS, WELL COMPLETIONS, OIL AND GAS PRODUCTION BY COUNTY -- 1963 (SHEET 1 of 2)

County	Permits Issued	Classification of 1963 well completions								County Production	
		Oil Wells	Gas Wells	LPG	GS	OBS	SWD	Dry Holes	Total	Barrels Oil	MCF Gas
Alcona	1										
Allegan	4							5	5	261,707	616,788
Arenac	6	1						3	4	346,497	
Barry	3	2						3	5	17,285	
Bay										368,258	
Branch	2							4	4		
Calhoun	23	7					1	16	24	2,795,008	4,042,268
Cass	5	2						4	6	15,001	
Cheboygan	2							2	2		
Clare	34	3			23			4	30	530,914	198,050
Clinton	3							4	4		
Crawford										118,760	590,842
Eaton								1	1		
Genesee	1							1	1	2,423	
Gladwin	3	1						3	4	431,091	
Gratiot	10							4	4	71,043	9,706
Hillsdale	112	39						66	105	4,277,511	3,489,613
Huron	4							4	4	1,816	
Ingham								1	1		
Ionia	2							2	2	110	
Isabella	3	1						4	5	402,374	5,707
Jackson	19	5						17	22	2,269,548	2,174,451
Kalamazoo	3							3	3		
Kalkaska	2							2	2	19,370	46,681
Kent	4	1						3	4	127,368	19,143
Lake	2							1	1	2,727	
Lapeer	7	5						1	6	23,357	
Lenawee	50	1	31					15	47	1,413	
Livingston	1							1	1		1,546

TABLE 2.--DRILLING PERMITS, WELL COMPLETIONS, OIL AND GAS PRODUCTION BY COUNTY — 1963 Continued (SHEET 2 of 2)

Macomb	38		9					21	30	6,460	1,697,032
Manistee	1							1	1		
Mason	43	12						27	39	264,437	5,160
Mecosta	18	1			5			5	11	29,951	152,146
Midland	1	1						1	2	267,507	15,207
Missaukee	10	2			4			4	10	506,445	1,001,277
Monroe	4	1						2	3	11,417	
Montcalm	31	1	1		13			6	21	342,945	136,630
Montmorency										81	
Muskegon	2	1						3	4	13,486	10,627
Newaygo	4	1						2	3	29,920	118,527
Oakland			1					1	2	1,428	445
Oceana	21	2						23	25	274,296	3,177
Ogemaw	4	1						1	2	364,030	673,075
Osceola	16				10			5	15	302,349	235,705
Oscoda	1									1,722	
Otsego											43,212
Ottawa	30	13						9	22	192,397	137,736
Presque Isle	1							1	1		
Roscommon	1							1	1	190,286	1,203,997
Saginaw										38,444	
Sanilac	7							8	8		
Shiawassee	1							3	3		
St. Clair	123	16	29		2			66	113	901,121	14,277,741
Tuscola	3	3						1	4	84,638	
Van Buren	26	10						12	22	27,971	
Washtenaw	5							5	5	24,139	345,318
Wayne	5	2		2		1		1	6	12,696	643,891
Wexford	2		1					1	2		
Totals 58 counties	704	135	72	2	57	2	1	384	652	15,971,747	31,895,701

TABLE 3.--DRILLING PERMITS AND WELL COMPLETIONS BY DISTRICTS - 1963

District	Permits Issued	Wells[1] Completed	Oil Wells	Gas Wells	Combined Initial Production		Dry Holes	Service Wells			Wildcat Wells	Successful Wildcats	Geo. Test Permits
					Bbls. Oil	MCF Gas		LPG	GS	SWD			
Basin	147	142	15	1	370	2,120	71	0	55	0	49	6	0
Northern	7	5	0	0	0		5	0	0	0	5	0	0
Western	75	74	16	1	607	200	57	0	0	0	44	2	0
Southeastern	375	338	69	70	11,252	854,070	194	2	2	1	94	7	
Southwestern	100	93	35	0	2,064	3,150	57	0	0	1	46	3	0
Totals	704	652	135	72	14,293	859,540	384	2	57	2	238	18	0

1. Does not include reworked and deepened wells.

TABLE 4.--DRILLING PERMITS AND WELL COMPLETIONS BY MONTH - 1963

Month	Permits Issued	Exploratory Wells	Field Wells	CLASSIFICATION OF WELL COMPLETIONS							Combined Initial Production of Producing Wells	
				Oil Wells	Gas Wells	Service Wells			Dry Holes	Total Completions	Bbls. Oil	MCF Gas
						LPG	GS	SWD				
January	31	23	18	10	2	0	0	0	29	41	2,016	250
February	46	13	21	7	6	0	1	0	21	35	198	6,350
March	39	17	26	11	6	0	3	0	26	46	1,765	12,638
April	68	15	26	12	4	0	3	0	25	44	3,271	5,907
May	57	16	25	8	4	0	9	0	29	50	1,032	10,190
June	60	27	23	8	5	0	12	0	37	62	1,045	122,500
July	72	27	35	12	10	0	9	0	40	71	220	27,800
August	57	17	37	15	8	1	1	1	30	56	787	125,520
September	63	19	39	17	10	1	2	0	31	61	1,514	84,990
October	69	17	43	14	11	0	2	1	36	64	729	429,700
November	90	21	27	11	3	0	11	0	34	59	1,160	18,675
December	52	25	34	10	3	0	4	0	46	63	556	15,020
Totals	704	237	354	135	72	2	57	2	384	652	14,293	859,540

TABLE 5 -- OIL FIELD BRINE PRODUCTION AND DISPOSAL DATA - 1963

BARRELS OF BRINE PRODUCED PER DAY			BARRELS OF BRINE RETURNED TO SUBSURFACE PER DAY									SURFACE DISPOSAL	
Producing Formation	Amount Produced	Amount Returned to Producing Formation	Formations used in Subsurface Disposal								Total Sub-Surface	Barrels per Day	
			Basal Drift	Parma	Marshall	Coldwater	Berea	Traverse	Dundee Reed City	Salina Niagaran		Roads	Pits
Marshall	0	0	0	0	0	0	0	0	0	0	0	0	0
Berea	71	0	0	0	50	1	0	0	0	0	51	0	0
Traverse	29,995	18,904	0	355	4,064	598	0	18,904	3,707		27,628	1,966	401
Dundee	110,267	93,736	0	4,423	3,752	0	67	7,640	93,736	0	109,618	502	147
Detroit River	806	0	0	0	202	0	0	22	384	0	608	41	157
Salina-Niagaran	1,744	0	0	0	0	0	0	49	1,639	0	1,688	0	56
Trenton	6,813	0	0	0	0	0	0	193	61	5,853	6,107	621	85
Totals	149,696	112,640	0	4,778	8,068	599	67	26,808	99,527	5,853	145,700	3,130	866
Percent of Total	100	75.23	0	3.19	5.39	.40	.04	17.9	66.44	3.90	97.33	2.09	.58

* * ACTIVE MICHIGAN OIL REFINERIES * *

COMPANY	REFINERY LOCATION	NOMINAL CAPACITY* Barrels per Day
Bay Refining Corporation	Bay City	22,500
Crystal Refining Company of Carson City, Inc.	Carson City	6,200
Lakeside Refining Company	Kalamazoo	3,500
Leonard Refineries, Inc.		
Leonard Division - Plant No. 1.	Alma.	10,000
Mid-West Division - Plant No. 2	Alma.	11,500
Roosevelt Division - Plant No. 3	Mt. Pleasant	7,500
Marathon Oil Company.	Detroit.	45,000
Marathon Oil Company.	Muskegon	15,000
Naph-Sol Refining Company	Muskegon	10,000
Osceola Refining Company	Reed City	7,500
Osceola Refining Company	West Branch	5,000
Petroleum Specialties, Inc.	Flat Rock	6,500
Socony-Mobile Oil Company, Inc.	Trenton	37,500
Wyandotte Chemical Corporation	Wyandotte	2,344
	Total Refinery Capacity	190,044

*Individual refinery operating rates may be either more or less than the nominal rates shown.

PART II
OIL AND GAS FIELDS

EXPLANATION OF PART II CONTENTS

Part II brings together general information on Michigan's oil and gas fields, and gas storage reservoirs. The tables summarize information relating to oil and gas accumulations which have been designated and named as oil or gas fields.

LOCATION OF SIGNIFICANT OIL AND GAS FIELDS. All fields are confined to the Southern Peninsula of Michigan. The map indicates the general distribution of the more important oil and gas fields within the several districts. The division of the Southern Peninsula into Basin, Northern, Western, Southeastern, and Southwestern Districts is arbitrary and convenient in presenting regional statistical data.

PRODUCING AREAS BY ROCK UNIT. The several maps show the producing areas by rock unit or formation. The stippled areas on the individual maps do not delineate the lateral limits of the rock unit or formation, but indicate the general area of known production from that individual unit.

OIL AND GAS FIELDS. Most fields consist of one pool with oil or gas production coming from a single formation. A few fields have separate pools, each producing from a different formation or stratigraphic interval and at a different depth. Pools for individual fields are shown under PRODUCING FORMATION. The PAY ZONE part of the table generally refers to the discovery well for the specific pool. The PAY THICKNESS shown on the tables does not necessarily indicate net producing pay for the reservoir. The DEEPEST ZONE TESTED column indicates the deepest total depth and formation penetrated in the field.

ABANDONED OIL AND GAS FIELDS. Oil and gas fields are considered abandoned when all wells have been plugged to the surface and the equipment has been removed from the area. Fields abandoned during a given year are entered into the abandoned field tables in the following year. Abandoned oil fields with less than 500 barrels of cumulative oil production are not shown in the tables. Production from the fields having less than 500 barrels cumulative production is accounted for in the table summaries.

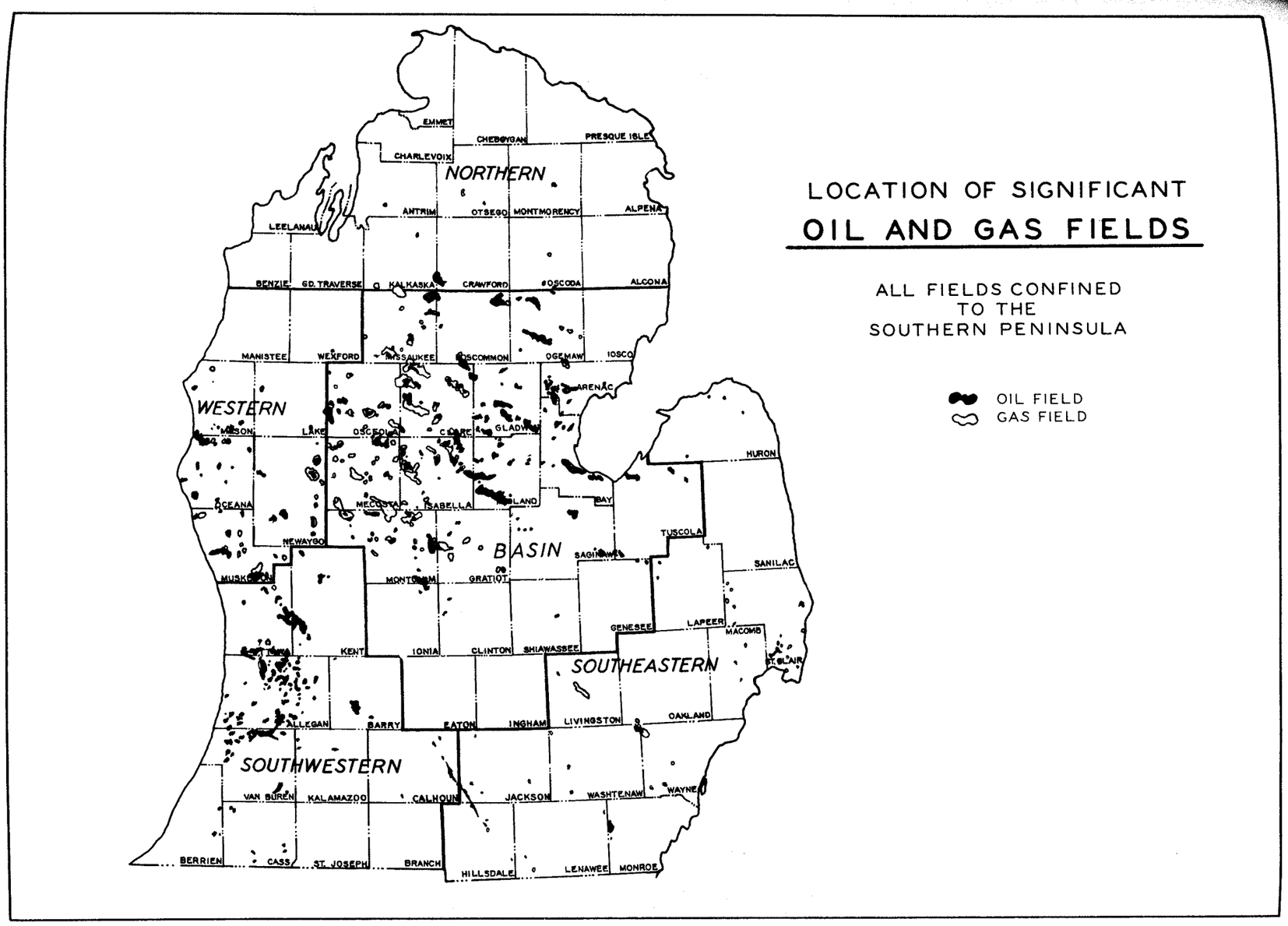
GAS FIELDS. Many gas fields are listed as "shut-in" because of lack of marketing facilities, slow field development, or lack of substantial reserves. Production from fields listed as "Domestic" or "Lease Fuel" is not metered or considered commercial.

GAS STORAGE RESERVOIRS. Most gas storage reservoirs were originally classified as gas fields or pools and upon depletion, or near depletion, they were converted to storage reservoirs. Undeveloped gas storage reservoirs are gas pools that have been designated to become storage reservoirs at some future time.

OIL WELL GAS. This is casinghead gas produced incidental to the production of oil from pools or fields generally classified as oil accumulations.

CASINGHEAD GAS PLANT DATA. These tables indicate the distribution of gross input gas to plants and the resulting net hydrocarbons available for market.

FLUID INJECTION INTO PRODUCING FORMATIONS. For most fields listed in these tables, the injection of oil field brines back into the producing formation is a combination brine disposal and pressure maintenance project. A number of fields have secondary recovery units or pilot secondary recovery projects in operation.

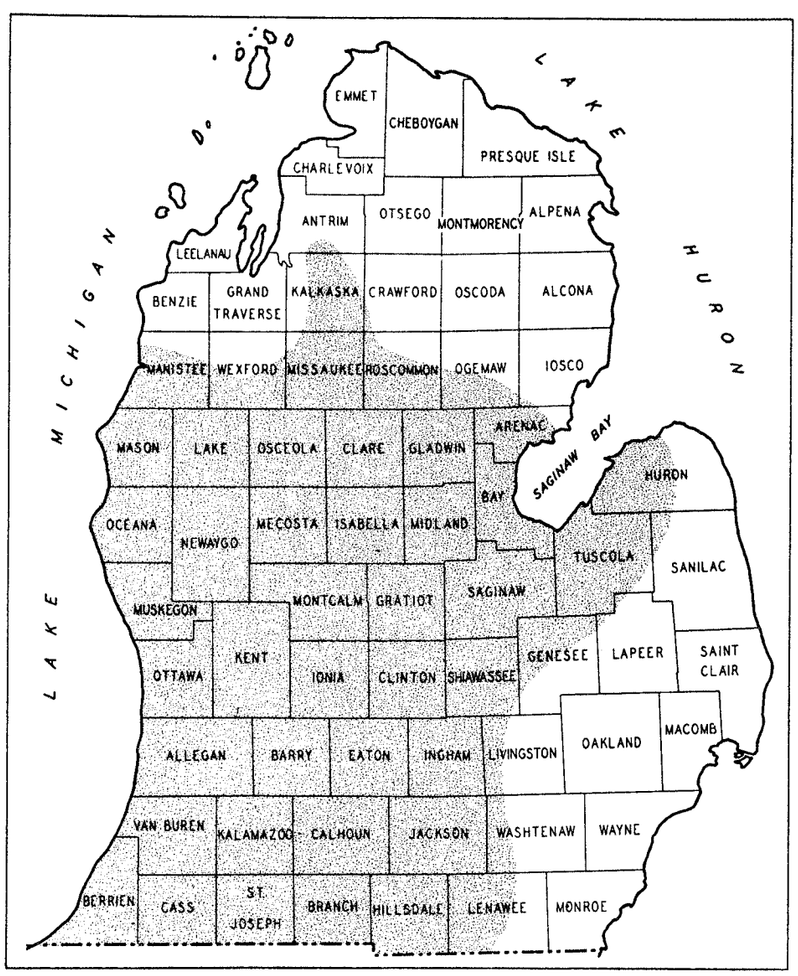


PRODUCING AREAS BY ROCK UNIT

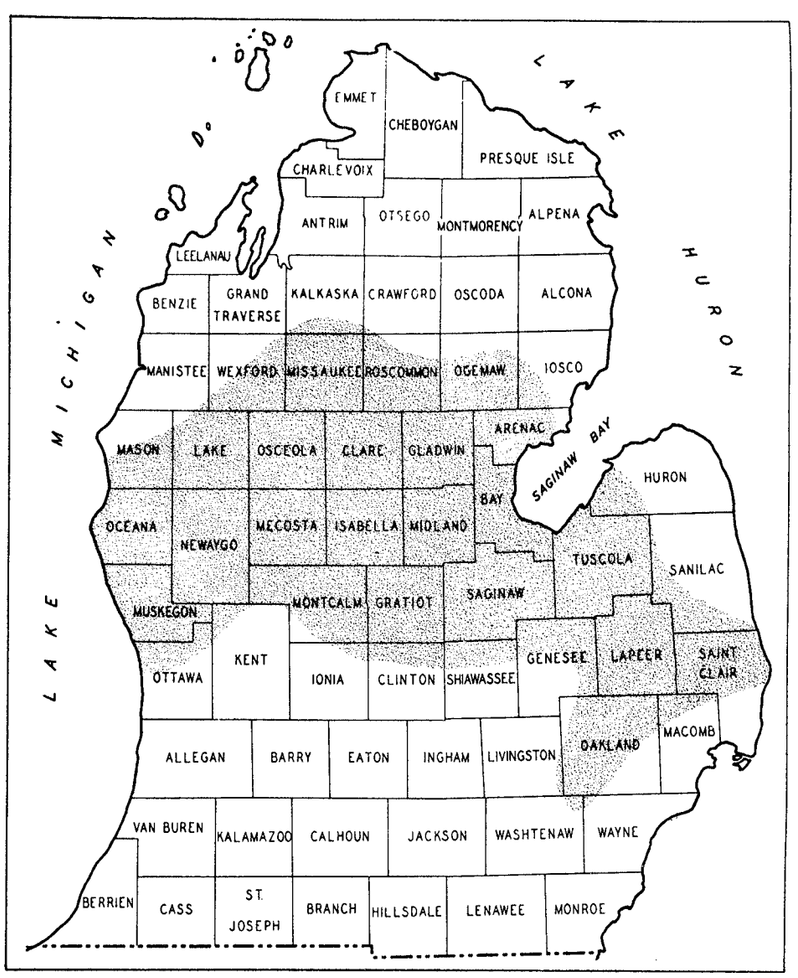
GENERAL PROVED AREA

MICHIGAN STRAY

BEREA



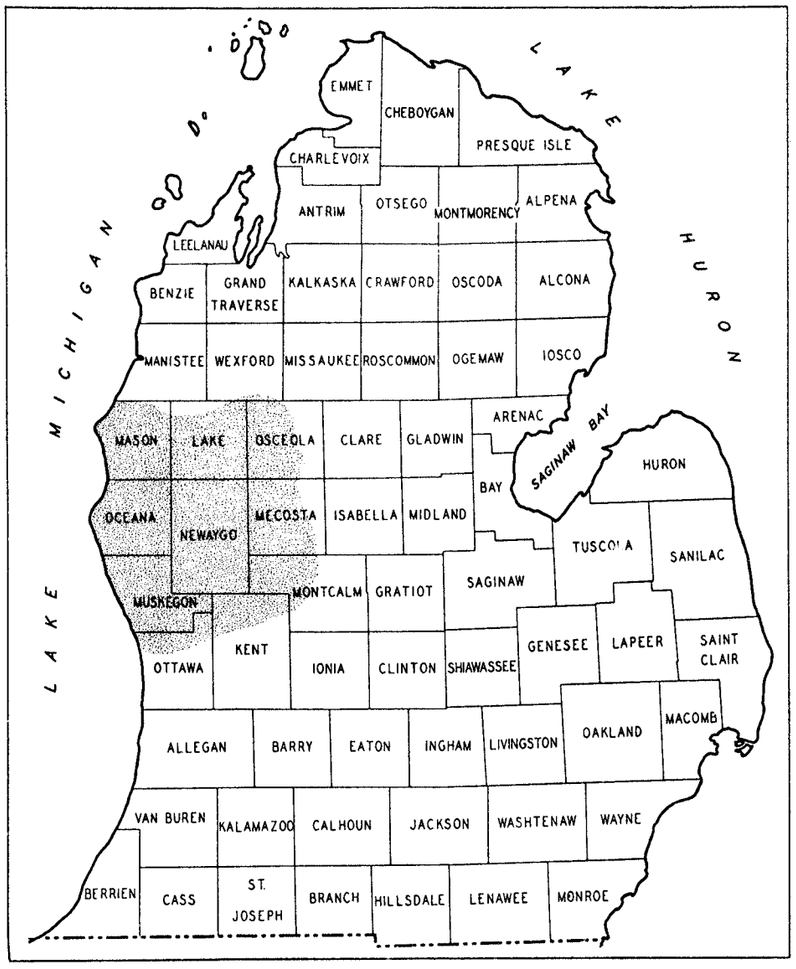
TRAVERSE GROUP



DUNDEE

PRODUCING AREAS BY ROCK UNIT

GENERAL PROVED AREA



REED CITY ZONE

DETROIT RIVER GROUP

SALINA AND NIAGARAN

TRENTON AND BLACK RIVER