

MICHIGAN OIL AND GAS FIELDS Continued

FIELD NAME	POOL CLASSIFICATION			ACTIVE OIL FIELD OR POOL			ACTIVE GAS FIELD OR POOL			GAS STORAGE RESERVOIR			UNDEVELOPED GAS STORAGE RESERVOIR							
	COUNTY TOWNSHIP PRODUCING SECTIONS	YEAR OF DISC.	PRODUCING FORMATION OR POOL	DEPTH IN FEET	PAY ZONE THICKNESS AND LITHOLOGY A.P.I.	DEEPEST FORMATION OR POOL TESTED	DEPTH IN FEET	NUMBER OF OIL OR GAS WELLS TO COMP. ABAND. PRODUCING SHUT IN AT END OF 1970	OIL PRODUCTION - BBL. PRODUCED THROUGH 1970	CUMULATIVE THROUGH 1970	RECOVERY PER ACRE (BBL.)	DRILLED ACRES	GAS PRODUCTION - Mcf. PRODUCED THROUGH 1970	CUMULATIVE THROUGH 1970	RECOVERY PER ACRE (BBL.)	DRILLED ACRES	BRINE PRODUCTION DISPOSAL SURFACE	TOTAL BBL. DAY		
PENTWATER	OCEANA-MASON	1948	TRAVERSE	1585	8 L 40.4	PRAIRIE DU CHIEN	5383	143	0	0	58	26,857	6,610,727	0	1,010,713	2,000	1,944	1,559	*1	1,560
		1948	DUNDEE	2088	10 D 43.1															
WEARE TWP., 16N-17W, SECTIONS 4, 5, 6, 7, 8 PENTWATER TWP., 16N-18W, SECTIONS 1, 2, 12 SUMMIT TWP., 17N-17W, SECTION 31																				
OCEANA																				
PENTWATER LAKE		1969	TRAVERSE	1612	2 L	TRAVERSE		1651	3	2	0	3	26,976	26,976	120	225	0	*2	2	
PENTWATER TWP., 16N-18W, SECTION 26																				
PETERS	ST. CLAIR	1955	SALINA-NIAGARAN	2386	47 D 39.0	CLINTON	2842	89	0	2	80	209,740	4,303,198	982,655	13,904,579	2140	2,011	512	0	512
CASCO TWP., 4N-15E, SECTIONS 5R 15, 5EK 16, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33, 34																				
PETERS, EAST	ST. CLAIR	1961	SALINA-NIAGARAN	2590	17 D 41.6	CLINTON	2777	9	0	0	8	PRODUCTION COMBINED WITH PETERS						116	0	116
CASCO TWP., 4N-15E, SECTIONS 24, 25 CHINA TWP., 4N-16E, SECTION 19																				
PIGEON RIVER	OTSEGO	1970	NIAGARAN REEF	4766	116 D 55	CLINTON	5270	1	1	0	1	55,259	55,259	80	691					
CHARLTON TWP., 31N-14W, SECTION 4																				
PINCINNING	BAY	1958	TRAVERSE	2151	1 L	DETROIT RIVER	3790	1	ABANDONED 1960			PRODUCTION COMBINED WITH PINCKNING DUNDEE	10							
		1944	DUNDEE	2898	7 D 36.2			12	0	0	2	4,309	864,566	100	7,860	200	0	200		
PINCINNING TWP., 17N-16E, SECTIONS 25, 26, 36 FRASER TWP., 16N-16E, SECTION 2																				
PINE	MONTCALM	1938	TRAVERSE	2836	1 L 45.0	DUNDEE	3308	2	ABANDONED 1963			105,506		20	5,275					
PINE TWP., 11N-8W, SECTION 29																				
PINE RIVER	GRATIOT	1936	TRAVERSE	2890	5 L	DUNDEE	3285	1	ABANDONED 1958			760		10	76					
		1942	DUNDEE	3280	2 L			2	ABANDONED 1956			13,285		90	148					
PINE RIVER TWP., 12N-34W, SECTION 31 SEVILLE TWP., 12N-44W, SECTION 36																				
PINE, SECS. 9 & 17	MONTCALM	1951	MICHIGAN STRAY	1251	1 S	DUNDEE	3469	2	0	0	2		37,272	80						DOMESTIC USE
PINE TWP., 11N-8W, SECTIONS 9, 17																				
PIONEER	MISSAUBEE	1931	TRAVERSE	3025	5 L	DUNDEE	3583	1	0	0	1			0	40					
PIONEER TWP., 24N-74W, SECTION 24																				
PIPESTONE	BERRIEN	1962	TRAVERSE	822	2 L 22.4	NIAGARAN	1353	2	ABANDONED 1966			85		20						
PIPESTONE TWP., 55-17W, SECTION 24																				
POLKTON	DTTAMA	1942	TRAVERSE	1878	2 L 37.8	DUNDEE	2351	13	0	0	5	1,786	64,799	170	381	0	2	2		
POLKTON TWP., 8N-14W, SECTIONS 8, 9, 10, 11, 14, 15, 16																				
PORTER	MIDLAND	1933	DUNDEE	3415	12 L 40.6	BLACK RIVER	9519	559	0	0	132	23,023	49,126,725	6690	7,243	7,178	1	7,179		
MIDLAND TWP., 13N-14W, SECTIONS 7, 8, 9, 10, 14, 15, 16, 17, 18, 19, 20, 21, 22, 23, 26, 27, 28 JASPER TWP., 13N-24W, SECTIONS 1, 2, 3, 11, 12 GREENDALE TWP., 14N-24W, SECTIONS 34, 35																				
PORT HURON	ST. CLAIR	1886	DUNDEE	575	20 L	CAMBRIAN	4948	21	ABANDONED 1921			NO RECORD								
ST. CLAIR TWP., 7N-17E, SECTION 32																				
PROSPER	MISSAUBEE	1948	MICHIGAN STRAY	1269	6 S	RICHFIELD	5254	3	0	0	2		0	152,882	480					LEASE FUEL
AETNA TWP., 22N-64W, SECTIONS 34, 35 CLAM UNION TWP., 21N-64W, SECTION 2																				
PROSPER	MISSAUBEE	1942	DUNDEE	2637	4 L 43.2	RICHFIELD	5254	13	0	0	6	11,940	1,751,225	520	3,329	1,810	0	1,810		
		1954	RICHFIELD	5128	21 D			1	ABANDONED 1957			7,088		40	177					
AETNA TWP., 22N-64W, SECTIONS 26, 35																				
PROSPER, SOUTH	MISSAUBEE	1947	DUNDEE	3798	8 D	DUNDEE	3808	7	0	0	7	137,034	330,378	280	1,180	708	0	708		
AETNA TWP., 22N-64W, SECTION 36 CLAM UNION TWP., 21N-64W, SECTIONS 1, 2																				

MICHIGAN OIL AND GAS FIELDS Continued

FIELD NAME	POOL CLASSIFICATION			ACTIVE OIL FIELD OR POOL			ACTIVE GAS FIELD OR POOL			GAS STORAGE RESERVOIR			UNDEVELOPED GAS STORAGE RESERVOIR								
	COUNTY TOWNSHIP PRODUCING SECTIONS	YEAR OF DISC.	PRODUCING FORMATION OR POOL	DEPTH IN FEET	PAY ZONE THICKNESS AND LITHOLOGY A.P.I.	DEEPEST FORMATION OR POOL TESTED	DEPTH IN FEET	NUMBER OF OIL OR GAS WELLS TO COMP. ABAND. PRODUCING SHUT IN AT END OF 1970	OIL PRODUCTION - BBL. PRODUCED THROUGH 1970	CUMULATIVE THROUGH 1970	RECOVERY PER ACRE (BBL.)	DRILLED ACRES	GAS PRODUCTION - Mcf. PRODUCED THROUGH 1970	CUMULATIVE THROUGH 1970	RECOVERY PER ACRE (BBL.)	DRILLED ACRES	BRINE PRODUCTION DISPOSAL SURFACE	TOTAL BBL. DAY			
PULLMAN	ALLEGAN	1949	TRAVERSE	1185	1 L	BASS ISLANDS	1942	9	ABANDONED 1951			26,840		90	298						
CASCO TWP., 1N-16W, SECTIONS 11, 12																					
PULLMAN, EAST	ALLEGAN	1949	TRAVERSE	1131	2 L 39.0	TRENTON	3020	25	0	1	12	3,068	377,019	250	1,508	167	0	167			
		1961	SALINA A-2 CARB.	1645	7 D			3	ABANDONED 1968				27,225	480							
LEE TWP., 1N-15W, SECTIONS 5, 6, 7, 8 (TRAVERSE) SECTIONS 5, 6, 8 (SALINA A-2 CARB.)																					
PULLMAN, EAST	ST. CLAIR	1960	SALINA-NIAGARAN	2423	60 D	NIAGARAN	2774	14	0	0	14	2	1,669,082	11,260,480	440		10	0	10		
CASCO TWP., 4N-15E, SECTIONS 11, 14, 15																					
RABBIT RIVER	ALLEGAN	1950	TRAVERSE	1655	3 L	TRAVERSE	1678	8	ABANDONED 1959			12,745		80	159						
SALEM TWP., 4N-13W, SECTIONS 28, 29, 32, 33																					
RAPID RIVER	KALASKA	1970	NIAGARAN REEF	6590	44 D 50	NIAGARAN	6810	1	1	0	1	0	0	80							
RAPID RIVER TWP., 28N-74W, SECTION 24																					
RAVENNA	MUSKOGON	1936	BEREA*	1205	10 D	DUNDEE	2306	31	1	0	5		1,432,593	4480						DOMESTIC USE	
RAVENNA TWP., 9N-14W, SECTIONS 4, 5, 6, 7, 8, 9, 17 SULLIVAN TWP., 9N-15W, SECTION 12 MOORLAND TWP., 10N-14W, SECTIONS 32, 33																					
RAVENNA	MUSKOGON	1952	TRAVERSE	1842	15 L	DETROIT RIVER	2601	37	0	2	2	183	456,939	730	659						
RAVENNA TWP., 9N-14W, SECTIONS 21, 27, 28, 29, 30, 31 SULLIVAN TWP., 9N-15W, SECTIONS 25, 36																					
RAVENNA, SEC. 27	MUSKOGON	1953	BEREA*	1182	6 D	DUNDEE	2500	3	0	0	2		32,243	480						DOMESTIC USE	
RAVENNA TWP., 9N-14W, SECTIONS 22, 27, 28																					
RAY	REFER TO TABLE 4 DEVELOPED GAS STORAGE RESERVOIRS																				
REDDING	CLARE	1940	MICHIGAN STRAY	1475	3 S	SYLVANIA	5462	1	0	0	5	3	32,692	160						LEASE FUEL	
REDDING TWP., 19N-64W, SECTIONS 27, 32 FREEMAN TWP., 18N-64W, SECTION 2																					
REED CITY	LAKE-OSCEOLA	1941	TRAVERSE	2925	5 L 43.7	ST. PETER Ss	8917			10		8,339	3,643,066	0	388,638	1600	2,277	541	0	541	
		1940	DUNDEE	3490	3 L 46.3																
		1941	REED CITY	3385	7 D 42.8	(LOREED UNIT - SEE TABLE 7)		164				245,068	40,231,694	5320	7,619	80	0	80			
		1955	DETROIT RIVER SZ	4184	73 DL 48.2			45	0	2	26	2	111,151	1,918,541	1800	1,066	30	*3	33		
(TWO WELLS COMINGLED WITH SOUR ZONE)																					
REED CITY (STRAY)	LINCOLN TWP., 18N-10W, SECTIONS 17, 18, 19, 20, 29, 30, 31, 32 RICHMOND TWP., 17N-10W, SECTIONS 4, 5, 6, 7, 8, 9 PINORA TWP., 18N-11W, SECTIONS 24, 25, 36																				
REED CITY (LOREED)	REFER TO TABLE 4 DEVELOPED GAS STORAGE RESERVOIRS																				
REED CITY, EAST	OSCEOLA	1947	TRAVERSE	3106	1 L 41.2	DETROIT RIVER	3840	8	0	0	3	6,286	384,521	80	4,807	970	0	970			
LINCOLN TWP., 18N-10W, SECTION 26																					
REEDER	MISSAUBEE	1964	MICHIGAN STRAY	1385	4 S	DUNDEE	4002	2	ABANDONED 1966					0	320						
REEDER TWP., 22N-74W, SECTION 32																					
REEMAN	NEWAYGO	1958	TRAVERSE	2099	1 L	TRAVERSE	2100	3	ABANDONED 1967			44,886		30	1,500						
SHELDON TWP., 12N-14W, SECTION 8																					
REYNOLDS	MONTCALM-MECOSTA	1955	TRAVERSE	2787	4 D 39.8	BASS ISLANDS	4300	16	0	0	6	1	42,817	4,444,179	2100	2,011	745	0	745		
		1954	REED CITY	3343	2 D 44.3			53	0	3	17	3									
REYNOLDS TWP., 12N-10W, SECTIONS 1, 2, 12, 13 WINFIELD TWP., 12N-9W, SECTIONS 6, 7, 8, 17, 18 AETNA TWP., 13N-10W, SECTION 36																					
RICH	LAFER	1962	DETROIT RIVER SZ	3028	5 D 33.9	SYLVANIA	3567	17	2	0	17	1	51,434	380,970	26,207	159,514	680	560	8	*54	62
		1970	BEREA	1386	29 S			1	1	0	1			160							
RICH TWP., 10N-10E, SECTIONS 21, 27, 28, 34 (DETROIT RIVER SZ) SECTION 21 (BEREA)																					

OIL AND GAS FIELDS

TABLE 4 DEVELOPED GAS STORAGE RESERVOIRS

FIELD NAME	COUNTY OR TOWNSHIP PRODUCING SECTIONS	YEAR OF DISC.	PRODUCING FORMATION OR POOL	PAY ZONE		DEEPEST FORMATION OR POOL TESTED	DEPTH IN FEET	NUMBER OF OIL OR GAS WELLS			OIL PRODUCTION - BBL.S. PRODUCED THROUGH 1970	GAS PRODUCTION - McF. PRODUCED THROUGH 1970	RECOVERY PER ACRE DRILLED (BBL.S.)	UNDEVELOPED GAS STORAGE RESERVOIR	
				DEPTH IN FEET	THICKNESS IN FEET			GRAVITY	LITHOLOGY	A.P.I.				TO COMP. ABAND. PRODUCING END IN 1970	OR SHUT DOWN
⊕ AUSTIN	MECOSTA	1933	MICHIGAN STRAY	1380	14 S	DETROIT RIVER	4043	0	0	93	6,109,033	3970			
	AUSTIN TWP., 14N-34, SECTIONS 2, 3, 4, 9, 10, 11, 12, 13, 14 COLFAX TWP., 15N-34, SECTIONS 32, 33 MORTON TWP., 14N-34, SECTIONS 6, 7														
⊕ BELLE RIVER MILLS	ST. CLAIR	1961	SALINA-NIAGARAN	2215	305 0	CLINTON	2694	1	0	43	1,212	1,235,700	23,636,641	840	
	CHINA TWP., 4N-16E, SECTIONS 11, 14, 15														
⊕ CRANBERRY LAKE	CLARE-MISSAUKEE	1943	MICHIGAN STRAY	1321	10 S	RICHFIELD	3201	0	0	171	7,537,451	7000			
	SUMMERFIELD TWP., 20N-54, SECTIONS 4, 5, 6, 7, 8, 9, 15, 16, 17, 18, 22, 23 WINTERFIELD TWP., 20N-64, SECTIONS 1, 2, 3, 10, 11, 12 CLAM UNION TWP., 21N-64, SECTIONS 29, 34, 35														
⊕ CROTON	NEWAYGO	1951	MARSHALL	917	4 S	SALINA	3993	0	1	6	1,320,835	860			
	CROTON TWP., 12N-11W, SECTIONS 29, 32														
⊕ FREEMAN-LINCOLN	CLARE	1938	MICHIGAN STRAY	1500	10 S	DETROIT RIVER	3937	30	0	111	18,099,490	6600			
	LINCOLN TWP., 18N-54, SECTIONS 7, 16, 17, 18, 19, 20, 21, 27, 28, 29 FREEMAN TWP., 18N-64, SECTIONS 2, 4, 9, 10, 11, 13, 14, 15, 23, 24														
⊕ GOODWELL	NEWAYGO	1943	MICHIGAN STRAY	1142	20 S	DETROIT RIVER	3562	1	0	64	5,875,670	3020			
	GOODWELL TWP., 14N-17W, SECTIONS 5, 6, 7, 8, 9, 16, 17 WILCOX TWP., 14N-12W, SECTION 31 MONROE TWP., 15N-17W, SECTION 31														
⊕ HAMILTON, NORTH	CLARE	1952	MICHIGAN STRAY - MARSHALL	4487	8 S	RICHFIELD	5395	0	0	62	5,450,065	3040			
	HAMILTON TWP., 19N-34, SECTIONS 5, 6, 7, 8 HAYES TWP., 19N-44, SECTION 1 FROST TWP., 20N-44, SECTIONS 35, 36														
⊕ HOWELL	LIVINGSTON	1925	SALINA-NIAGARAN	3920	9 0	ST. PETER S4	5958	0	0	69	23,678,120	2400			
	GENOA TWP., 2N-5E, SECTIONS 5, 6, 7, 8, 17 MARION TWP., 2N-4E, SECTIONS 1, 2, 12 HOWELL TWP., 3N-4E, SECTION 35														
⊕ IRA	ST. CLAIR	1923	SALINA-NIAGARAN	2276	33 0	CLINTON	2632	0	0	15	3,498,666	680			
	IRA TWP., 3N-15E, SECTIONS 1, 2, 11														
⊕ LENOX	MACOMB	1960	SALINA-NIAGARAN	2734	46 0	CLINTON	3018	0	0	11	2,152,679	300			
	LENOX TWP., 4N-14E, SECTION 32 CHESTERFIELD TWP., 3N-14E, SECTION 5														
⊕ MARION(WINTERFIELD)	CLARE-OSCEOLA	1940	MICHIGAN STRAY	1344	15 S	SYLVANIA	5100	0	0	282	20,084,934	10720			
	WINTERFIELD TWP., 20N-64, SECTIONS 17, 18, 19, 20, 21, 27, 28, 29, 30, 31, 32, 33, 34, 35 REDDING TWP., 19N-64, SECTIONS 1, 2, 3, 4, 6 MARION TWP., 20N-74, SECTIONS 24, 25, 36 MIDDLE BRANCH TWP., 19N-74, SECTION 1														
⊕ NORTHVILLE	WAYNE-WASHTENAW	1924	TRENTON-BLACK RIVER	4395	70 0	CAMBRO-OROVICIAN	5850	0	0	70	18,126,876	2825+			
	FOR LOCATION SEE NORTHVILLE, TABLE 4														
⊕ ORIENT	OSCEOLA-CLARE	1945	MICHIGAN STRAY	1508	11 S	SYLVANIA	5307	18	0	69	5,350,896	2600			
	ORIENT TWP., 17N-74, SECTIONS 2, 3, 10, 11, 12, 13, 14 GARFIELD TWP., 17N-64, SECTIONS 18, 19														
⊕ OVERISEL	ALLEGAN	1956	SALINA	2650	12 0	TRENTON	4060	0	0	186	14,645,048	6660			
	OVERISEL TWP., 4N-14W, SECTIONS 4, 5, 8, 9, 10, 14, 15, 16, 21, 22, 23, 27, 28														

DEVELOPED GAS STORAGE RESERVOIRS Continued

FIELD NAME	COUNTY OR TOWNSHIP PRODUCING SECTIONS	YEAR OF DISC.	PRODUCING FORMATION OR POOL	PAY ZONE		DEEPEST FORMATION OR POOL TESTED	DEPTH IN FEET	NUMBER OF OIL OR GAS WELLS			OIL PRODUCTION - BBL.S. PRODUCED THROUGH 1970	GAS PRODUCTION - McF. PRODUCED THROUGH 1970	RECOVERY PER ACRE DRILLED (BBL.S.)	UNDEVELOPED GAS STORAGE RESERVOIR		
				DEPTH IN FEET	THICKNESS IN FEET			GRAVITY	LITHOLOGY	A.P.I.				TO COMP. ABAND. PRODUCING END IN 1970	OR SHUT DOWN	SHUT DOWN
⊕ RAY	MACOMB	1961	SALINA-NIAGARAN	2945	101 0	NIAGARAN	3273	0	0	35	1,689	3,728,435	35,201,693	660		
	RAY TWP., 4N-13E, SECTIONS 1, 2, 11 ARMADA TWP., 5N-13E, SECTION 36															
⊕ REED CITY	OSCEOLA-LAKE	1940	MICHIGAN STRAY	1217	12 S	ST. PETER S4	8960	17	0	102	7,642,246	4880				
	REED CITY															
⊕ RIVERSIDE	MISSAUKEE	1940	MICHIGAN STRAY	1435	7 S	DUNDEE	3953	0	0	97	5,188,481	3680				
	RIVERSIDE TWP., 21N-74, SECTIONS 15, 16, 17, 19, 20, 21, 22, 23															
⊕ SALEM	ALLEGAN	1937	SALINA	2725	2 0	TRENTON	3792	0	0	88	2,973	11,310,688	4960			
	SALEM TWP., 4N-13W, SECTIONS 2, 3, 9, 10, 11, 12, 14, 15, 16, 17, 21, 22, 23 JAMESTOWN TWP., 5N-13W, SECTIONS 34, 35															
⊕ SHAVER (SUMNER - NEW HAVEN)	GRATIOT-MONTCALM	1935	MICHIGAN STRAY	1020	11 S	DUNDEE	3536	0	0	49	11,114,906	3920				
	NEW HAVEN TWP., 10N-44, SECTIONS 2, 3, 4, 5, 8, 9, 10, 11 SUMNER TWP., 11N-44, SECTIONS 31, 32, 33, 34 CRYSTAL TWP., 10N-54, SECTIONS 1, 2, 3, 5, 6 FERRIS TWP., 11N-54, SECTIONS 22, 26															
⊕ SIX LAKES	ISABELLA-MEGOSTA-MONTCALM	1934	MICHIGAN STRAY	1270	25 S	DETROIT RIVER	3790	0	0	268	51,604,719	11480				
	ROLLAND TWP., 13N-64, SECTIONS 29, 30 HINTON TWP., 13N-84, SECTIONS 23, 24, 25 MILLBROOK TWP., 13N-74, SECTIONS 27, 28, 29, 30, 31, 32, 33, 34, 35, 36 BELVIDERE TWP., 12N-74, SECTIONS 14, 15, 16, 17, 18, 20, 21, 12,															
⊕ WINFIELD	MONTCALM	1935	MICHIGAN STRAY	1125	8 S	DETROIT RIVER	3405	0	0	8	4,836,132	3240				
	WINFIELD TWP., 12N-94, SECTIONS 6, 7, 8, 16, 17, 18 REYNOLDS TWP., 12N-104, SECTIONS 1, 12															
⊕ WOODVILLE(NORWICH)	NEWAYGO	1943	MICHIGAN STRAY	1185	13 S	DETROIT RIVER	3405	5	0	46	2,685,259	2240				
	NORWICH TWP., 15N-11W, SECTIONS 16, 17, 20, 21, 26, 29															
TOTALS											75	1	8,439	4,965,135	285,148,498	

NOT INCLUDED WITH THE ABOVE FIELDS IS ONE SMALL STORAGE RESERVOIR LOCATED NEAR MARSHVILLE, ST. CLAIR COUNTY, GAS STORAGE CAPACITY IN THIS RESERVOIR TABLES DO NOT NECESSARILY RELATE TO CURRENT GAS STORAGE AREA OR BOUNDARIES. ALSO, THE SECTIONS DO NOT NECESSARILY RELATE TO POTENTIAL OR FUTURE GAS STORAGE AREA OR BOUNDARIES. THE SECTIONS OR PARTS OF SECTIONS, PRODUCE OIL OR GAS WELL ASSIGNED TO THE FIELD OR POOL PRIOR TO CONVERSION OR DESIGNATION AS GAS STORAGE.

MINOR OIL PRODUCED IN CONNECTION WITH STORAGE OPERATIONS.

1970 GAS PRODUCTION NOTED AS CUSHION GAS IN THE BELLE RIVER MILLS AND RAY STORAGE FIELDS IS CONSIDERED TO BE PART OF THE ORIGINAL NATIVE GAS CONTAINED IN THE RESERVOIR AND NOT TUBECED GAS.

TABLE 5 UNDEVELOPED GAS STORAGE RESERVOIRS

FIELD NAME	COUNTY TOWNSHIP PRODUCING SECTIONS (1) (2) (3)	YEAR OF COMM. PRODUCING SECTIONS (1) (2) (3)	PRODUCING FORMATION OR POOL	PAY ZONE DEPTH IN FEET	DEEPEST FORMATION OR POOL TESTED	DEPTH IN FEET	NUMBER OF OIL OR GAS WELLS TO COMP. ABAND. PRODUCING SHUT IN AT END	OIL PRODUCTION - BBL. PRODUCED IN 1970	GAS PRODUCTION - Mcf. THROUGH 1970	DRILLED ACRES	RECOVERY PER ACRE DRILLED (BBL.S.)	UNDEVELOPED GAS STORAGE RESERVOIR				
												DISPOSAL SURFACE	BRINE PRODUCTION BBL. SURFACE DAY			
BROOMFIELD-DEERFIELD	ISABELLA	1930	MICHIGAN STRAY	1355 5 S	SYLVANIA	4994 91	0 0 12	13,069,069	8080							
BROOMFIELD TWP., 14N-6W, SECTIONS 1, 2, 3, 4, 5, 9, 10, 11, 13, 14, 15, 23, 24, 25 DEERFIELD TWP., 14N-5W, SECTIONS 7, 17, 18, 19, 20, 29, 30 SHERMAN TWP., 15N-6W, SECTIONS 29, 30, 31, 32, 33, 36																
COLDWATER	ISABELLA	1945	MICHIGAN STRAY	1390 10 S	SYLVANIA	5090 48 26 1	44	271,896	7,380,501	2400						
COLDWATER TWP., 16N-6W, SECTIONS 28, 29, 30, 31, 32, 33 SHERMAN TWP., 15N-6W, SECTION 6																
EDMORE-RICHLAND	MONTCALM	1936	MICHIGAN STRAY	1300 8 S	DUNDEE	3700 47 0 1 10		3,591	8,956,687	6800						
HOME TWP., 12N-6W, SECTIONS 11, 12, 13, 14, 15, 19, 21, 22, 23, 24, 25, 26, 27, 28, 29, 30, 33 RICHLAND TWP., 12N-5W, SECTIONS 7, 8, 17, 18																
EVART	OSCEOLA	1941	MICHIGAN STRAY	1410 7 S	DETROIT RIVER	4457 33 0 0 7		4,895,722	5120							
OSCEOLA TWP., 18N-8W, SECTIONS 19, 21, 22, 23, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35																
TOTALS											219	26	2	73	31,487	34,301,979

UNDEVELOPED GAS STORAGE RESERVOIRS ARE GAS OR OIL POOLS THAT HAVE BEEN DESIGNATED TO BECOME STORAGE RESERVOIRS AT SOME FUTURE TIME. THOSE THAT SHOW GAS PRODUCTION FOR 1970 ARE CONSIDERED ACTIVE POOLS.

THE PRODUCING SECTIONS LISTED IN GAS STORAGE RESERVOIR TABLES DO NOT NECESSARILY RELATE TO CURRENT GAS STORAGE AREA OR BOUNDARIES. ALSO, THE SECTIONS DO NOT NECESSARILY RELATE TO THE CURRENT GAS STORAGE AREA OR BOUNDARIES. ALL THE SECTIONS LISTED ARE LISTED ARE THOSE WHICH CONTAINED AT LEAST ONE PRODUCE OIL OR GAS WELL ASSIGNED TO THE FIELD OR POOL PRIOR TO CONVERSION OR DESIGNATION AS GAS STORAGE.

TABLE 6 MISCELLANEOUS OIL WELLS

Field Name*	Location and Producing Sections	Completion and Abandonment		Formation	Production
		1967	1967		
Big Prairie	Newaygo	13N-11W	3	Dundee	78
Bloomfield, Sec. 20	Huron	17N-14E	20	Traverse	71
Blue Lake, Sec. 5	Muskegon	12N-16W	5	Traverse	26
Calvin	Cass	7S-14W	1	Traverse	67
Colfax, Sec. 35	Oceana	16N-15W	35	Traverse	35
Dayton, Sec. 16	Newaygo	13N-14W	16	Traverse	314
Decatur, Sec. 4	Van Buren	4S-14W	4	Traverse	38
Edwardsburg	Cass	8S-15W	22, 23	Traverse	277
Evergreen, Sec. 22	Montcalm	10N-6W	22	Traverse	455
Fremont, Sec. 27	Isabella	13N-5W	27	Traverse	488
Gaines, Sec. 8	Kent	5N-11W	8	Traverse	47
Ganges, Sec. 4	Allegan	2N-16W	4	Traverse	64
Hinton, Sec. 21	Mecosta	13N-8W	21	Traverse	66
Hume, Sec. 12	Huron	18N-12E	12	Detroit River SZ	71
Indian Hills, Sec. 26	Oceana	16N-16W	26	Dundee	305
Jamestown, Sec. 29	Ottawa	5N-13W	29	Traverse	52
Jonesfield, Sec. 9	Saginaw	12N-1E	9	Dundee	35
Jonesfield, Sec. 24	Saginaw	12N-1E	24	Dundee	63
Lincoln, Sec. 9	Midland	15N-1E	9	Traverse	71
North Plains, Sec. 18	Ionia	8N-5W	18	Dundee	239
North Plains, Sec. 19	Ionia	8N-5W	19	Traverse	59
Oshtemo, Sec. 5	Kalamazoo	2S-12W	5	Traverse	50
Sheridan, Sec. 26	Mecosta	15N-7W	26	Traverse	173
Sheridan, Sec. 29	Newaygo	12N-14W	29	Traverse	199
Sherman, Sec. 4	Isabella	15N-6W	4, 18	Traverse	63
Shiawassee, Sec. 11	Shiawassee	6N-3E	11	Traverse	236
Silver Creek	Cass	5S-16W	22, 23	Traverse	25
Springfield, Sec. 22	Oakland	4N-8E	22	Salina-Niagara	649
St. Charles, Sec. 7	Saginaw	10N-3E	7	Traverse	111
Sumpter, Sec. 22	Wayne	4S-8E	22	Trenton	227
Tyrone, Sec. 15	Kent	10N-12W	15	Traverse	191
Watson, Salina	Allegan	2N-12W		Salina-Niagara	296
Watson, Sec. 8	Allegan	2N-12W	8	Traverse	374
Zeeland, Sec. 4	Ottawa	5N-14W	4	Traverse	0

* This list includes single wells that have been included in the oil field tables in previous summaries as pool discoveries. All have been abandoned and should not be considered as a part of Table 3.

PRORATED OIL FIELDS

As of April 1, 1971*

FIELD NAME	DRILLING UNIT	DRILLING PATTERN	CURRENT OIL ALLOWABLE	CURRENT GAS ALLOWABLE	CURRENT ALLOWABLE EFFECTIVE:
Albion-Pulaski-Scipio Trend	20 Acres	C NW $\frac{1}{4}$ / $\frac{1}{4}$ & C SE $\frac{1}{4}$ / $\frac{1}{4}$	110 Bopd	150 Mcf/d	7-1-1961
Big Hand	20 Acres	C NE SW $\frac{1}{4}$ / $\frac{1}{4}$ Section	50 Bopd	100 Mcf/d	4-1-1963
Columbus, Section 3	20 Acres	NE & SW $\frac{1}{4}$ / $\frac{1}{4}$ Section	75 Bopd	100 Mcf/d	2-1-1970
Columbus, North	20 Acres & 40 Acres	NE & SE $\frac{1}{4}$ / $\frac{1}{4}$ Section	100 Bopd (40 Acres) 50 Bopd (20 Acres)	150 Mcf/d (40 Acres) 75 Mcf/d (20 Acres)	10-1-1970
Johannesburg	80 Acres	C NE or SW $\frac{1}{4}$ / $\frac{1}{4}$ Section	300 Bopd	None	1-1-1971
Kalkaska, North	80 Acres	C NE or SW $\frac{1}{4}$ / $\frac{1}{4}$ Section	300 Bopd	None	1-1-1971
Peacock	40 Acres	C SW $\frac{1}{4}$ / $\frac{1}{4}$ Section	50 Bopd	Not prorated	8-1-1968
Peters	20 Acres	NW & SE $\frac{1}{4}$ / $\frac{1}{4}$ Section	100 Bopd	150 Mcf/d	11-1-1958
Pigeon River	80 Acres	C NE or SW $\frac{1}{4}$ / $\frac{1}{4}$ Section	300 Bopd	None	1-1-1971
Prosper, South	40 Acres	C NE $\frac{1}{4}$ / $\frac{1}{4}$ Section	75 Bopd	Not prorated	12-1-1967

* Data derived from Quarterly Report to Supervisor of Wells and Oil Advisory Board, April 1, 1971.

TABLE 7 SECONDARY RECOVERY OPERATIONS

FIELD AND COUNTY	OPERATOR OR COMPANY	TYPE OF PROJECT	DISC. YEAR PROJECT BEGAN	PAY ZONE		INJECTION OF INJECTED FLUID			VOLUME OF INJECTED FLUID			UNIT PRODUCTION IN 1970			UNIT CUMULATIVE 1-1-71					
				THICK.	DEPTH	TOTAL ACRES	INJECT. PRES.-PSIG	FRESH WATER	REC. GAS & FRESH WTR.	DISCONT.	BARRELS WATER	MCF GAS	INJ. WELLS	BARRELS WATER	MCF GAS	SALES NEF GAS	NO. WELLS PRODUCED	BARRELS OIL	SALES NEF GAS	BARRELS WATER
BEAVER CREEK	UNION OIL CO.	UNIT WTR. FLOOD	1947	RICH.	17	4400	4680		FRESH WATER			6,457,883	58	47,000	425,068	361,250	50	(P) 6,425,000 (S) 1,221,790	17,271,846	1,773,106
BEAVERTON, SOUTH	SUN OIL CO.	UNIT WTR. FLOOD	1936	DD.	9	3845	640		FRESH WATER			182,420	4	1,923,690		59,493	14	(P) 385,930 (S) 52,643	806,649	
BEAVERTON, WEST	PEAKE PET. CO.	UNIT WTR. FLOOD	1945	DD.	2	3676	480		FRESH WATER			73,310	3	433,318		5,110	4	(P) 162,188 (S) 4,346	28,290	
BERLIN	SUN OIL CO.	UNIT WTR. FLOOD	1960	NIAG.	30	3800	250		FRESH WATER			109,500	1	109,500		NONE	3	(P) 359,456 (S) NONE	NONE	
CRANBERRY LAKE	FARM. PETRO. COOP	UNIT WTR. FLOOD	1951	RICH.	15	5048	680		FRESH WATER			330,783	7	336,544		6,205	6	(P) 1,048,699 (S) NONE	536,895	
EAST NORWICH	SUN OIL CO.	UNIT-RECY. GAS & WTR. FLOOD	1942	RICH.	14	4440	4880		REC. GAS & FRESH WTR.	DISCONT. 1962		1,477,207	45	10,379,447	624,886	64,970	75	(P) 5,800,000 (S) 2,553,979	6,264,191	1,163,108
ENTERPRISE	SUN OIL CO.	UNIT-RECY. GAS & WTR. FLOOD	1943	RICH.	16	4405	1320		RECYCLE GAS & FRESH WTR.	DISCONT. 1961		609,592	13	1,419,611	40,076	12,045	20	(P) 1,925,000 (S) 591,682	747,493	657,234
GROUT	SUN OIL CO.	UNIT WTR. FLOOD	1926	RICH.	10	5039	480		FRESH WATER			194,262	3	1,977,436		70,080	12	(P) 900,000 (S) 510,127	343,713	
HAMILTON	SUN OIL CO.	UNIT WTR. FLOOD	1922	RICH.	12	5145	1800		FRESH WATER			975,896	17	9,862,881	138,205	311,345	27	(P) 2,800,000 (S) 2,193,783	3,435,766	1,892,933
HEADQUARTERS	FARM. PETRO. COOP	UNIT WTR. FLOOD	1922	RICH.	13	4946	720		FRESH WATER			476,462	11	785,946		8,760	7	(P) 708,951 (S) 8,790	74,825	
KANKAHLIN	GULF OIL CORP.	UNIT WTR. FLOOD	1938	DD.	45	2830	1180		FRESH WATER			79,379	9	5,124,480		88,230	34	(P) 2,167,799 (S) 343,581	1,807,497	
LAKE OSCEOLA	MICH. CON. GAS CO. CO.	UNIT-GAS STORAGE IN OIL RESERVOIR	1940	DD-R-C.	21	3585	5000		PRODUCED BRINE & EXTRANEUS GAS			588,015	124	144,709,921		187,610	164	(P) 39,294,000 (S) 1,237,694	16,257,876	164,646,094
RICHMOND **	ISBRANDSTEN CO., INC.	UNIT WTR. FLOOD	1955	DR(SZ)	11	4184	1097		FRESH WATER			469,196	8	1,947,853		8,030	13	(P) 1,042,036 (S) 164,979	2,459,902	85,955
ROSE CITY	MUSKEGON DEV. CO.	UNIT WTR. FLOOD	1943	RICH.	9	4125	4600		FRESH WATER			393,470	38	3,673,148	172,790	17,885	61	(P) 3,492,944 (S) 87,000	5,423,201	218,817
ROSE CITY, CENTRAL	MUSKEGON DEV. CO.	UNIT WTR. FLOOD	1951	RICH.	8	4125	1560		FRESH WATER				9	STARTED INJECTION IN 1971	3,832	3,832	10	(P) 1,025,028 (S) NONE	936,818	63,415
ROSE CITY, WEST	SUN OIL CO.	UNIT WTR. FLOOD	1932	RICH.	10	4150	320		FRESH WATER			188,360	5	530,899		273	4	(P) 510,888 (S) 4,000	776,209	29,655
ST. HELEN	SUN OIL CO.	UNIT-RECY. GAS & WTR. FLOOD	1941	RICH.	9	4480	3920		RECYCLE GAS & FRESH WTR.			788,357	39	6,012,564	240,819	20,075	54	(P) 2,760,000 (S) 346,750	922,741	437,663
WEST BRANCH	PHENIX OIL CO.	UNIT WTR. FLOOD	1933	DD.	28	2650	2730		BRINE			291,420	12	853,921		70,080	58	(P) 3,288,589 (S) 86,000*	380,290	

* LOREED UNIT IN REED CITY FIELD.
** RICHMOND UNIT - THIS UNIT PRODUCES FROM THE DETROIT RIVER SOUR ZONE

THE GAS WITHDRAWN EXCEEDS THE GAS INJECTED IN 1970 IN THE DETROIT RIVER SOUR ZONE. FIGURE FOR THE YEAR.

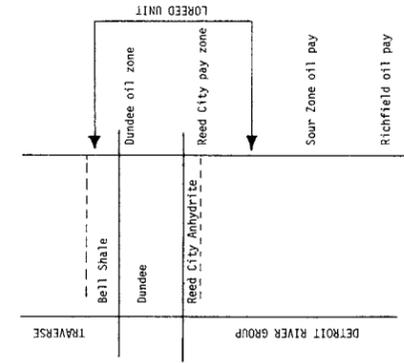
INJECTION OF EXTRANEUS WATER IN KANKAHLIN FIELD WAS SUSPENDED AT END OF 1966. FROM THAT DATE, ONLY UNIT PRODUCED WATER IS BEING INJECTED.

NOTE: THE LOREED UNIT IN THE REED CITY FIELD, A MULTI-POOL FIELD, IS A GAS STORAGE - SECONDARY OIL RECOVERY OPERATION ENCOMPASSING SEVERAL SECTIONS. PRODUCTION FROM THIS UNIT IS REPORTED IN THE LOREED UNIT. THE STARTING DATE OF THE LOREED UNIT IS SHOWN IN THE STRATIGRAPHIC SECTION TO THE RIGHT.

THE RICHMOND SHOULD NOT BE CONSIDERED AS A FIELD. IT IS THE DETROIT RIVER SOUR ZONE POOL RESERVOIR IN THE REED CITY FIELD. THE RICHMOND IS NOT RELATED TO THE LOREED OPERATION. ROSE CITY, WEST, AND ROSE CITY, CENTRAL, AS NOTED ABOVE ARE UNIT OPERATIONS IN THE ROSE CITY FIELD. TOTAL UNIT ACRES AND OTHER DATA DOES NOT NECESSARILY CORRESPOND WITH DRILLED ACRES AS NOTED ON TABLE 3. ALL PRODUCTION DATA WERE ASSEMBLED AND PROVIDED BY THE PRODUCTION AND PROPRATION UNIT, OIL AND GAS SECTION.

NUMBER OF ACTIVE SECONDARY RECOVERY OPERATIONS	18
AMOUNT OF GAS INJECTED DURING 1970	1,024,931 MCF (NEGATIVE)
AMOUNT OF WATER INJECTED DURING 1970	13,687,512 BBL.
NUMBER OF WATER INJECTION WELLS	288
NUMBER OF GAS INJECTION WELLS	154
TOTAL PRIMARY OIL PRODUCTION IN 1970	200,931 BBL.
TOTAL SECONDARY OIL PRODUCTION IN 1970	1,769,789 BBL.
NUMBER OF PRODUCING WELLS	616

OIL PRODUCED BY SECONDARY RECOVERY METHODS AMOUNTS TO ABOUT 15 PERCENT OF THE STATES TOTAL PRODUCTION.



* 19,554 BBL. OF THIS SECONDARY OIL IS FROM A WATER SOURCE WELL IN THE TRANSVERSE FORMATION.

FIGURES DEFINED AS SECONDARY OIL (S) REPRESENT THE DIFFERENCE BETWEEN UNIT RECOVERY AT THE END OF 1970 AND EXTRAPOLATED ULTIMATE PRIMARY RECOVERY (P) AT THE BEGINNING OF SECONDARY OPERATIONS.

COMPILERS.

TABLE 8 GAS PLANT OPERATIONS BY PLANT OR FIELD, 1970 (All figures in MCF)

Plant or Field	Input Totals	Plant Fuel	Storage and/or		Line Loss	Vented	Extraction Loss	To Pipe Line	L.P.G. Recovery Gallons
			Lease Fuel	Repressuring Recycling					
*Albion-Scipio	11,817,706	1,077,100	0	0	0	97,883	923,011	9,719,712	27,854,794
*Beaver Creek	516,461	17,257	121,407	0	0	14,437	23,278	340,082	124,511
Belle River Mills	11,224,914	223,462	0	6,037,985	0	0	479,570	4,483,897	14,842,268
Belle River Mills	plant functions as a combined recycling and storage operation. Plant ceased operation Oct. 1970								
Boyd	12,217,505	180,889	154,319	2,947,535	226,894	13,792	397,986	8,296,090	12,898,700
Boyd Plant,	serving several fields, receives both dry and oil well gas.								
*Hamilton	210,157	11,939	53,127	0	0	0	7,156	137,935	178,263
*Hanover	87,501	0	0	0	0	0	0	87,501	0
*Norwich East	820,404	87,474	71,164	0	0	0	0	661,766	0
Reed City	939,263	23,151	0	0	0	0	12,544	903,566	406,460
Reed City plant	serves a combination storage and secondary recovery operation in an oil reservoir. Due to plant explosion, plant was not operating except during December 1970.								
*Rose City	283,987	6,841	0	0	0	0	0	277,146	0
*St. Helen	497,864	25,865	52,658	0	0	0	1,171	418,170	29,483
Willow Run	204,043,918	450,310	0	0	0	0	549,892	203,043,717	18,298,313
Totals	242,659,680	2,104,288	452,675	8,985,520	226,894	126,112	2,394,608	228,369,582	74,632,792

* Receives and processes oil well gas only.

NOTE: The above table is the record of plants which are serving oil field operations, or which are extracting natural gas liquids from designated dry gas sources (Belle River Mills and Willow Run). Transmission and dry gas storage facilities are excluded.

TABLE 9. PRIMARY SUPPLY LOCATIONS AND STORAGE FACILITIES FOR LIQUIFIED PETROLEUM GAS

Company	Plant Location		Type of Facility	Facility Capacity Gallons of LPG
	County	Locality		
Bay Refining Company	Bay	Bay City	Refinery Storage	155,200
Dow Chemical Company	Midland	Midland	Chemical Plant (Underground)	8,820,000
Leonard Refineries, Inc.	Gratiot	Alma	Refinery Storage	120,000
Marathon Oil Company	Hillsdale	Mosherville	Natural Gas Processing Plant	294,000
Cities Service Oil Company	Kent	Lowell	Underground Storage	48,150,000
Skelly Oil Company (1)	Kent	Alto	Underground Storage	10,890,748
Consumers Power Company	Macomb	New Baltimore	Natural Gas Processing Plant	150,000
Michigan Consolidated Gas Co.	St. Clair	St. Clair	Natural Gas Processing Plant	450,000
Michigan Consolidated Gas Co.	Washtenaw	Ypsilanti	Natural Gas Processing Plant	450,000
Mobil Oil Company	Wayne	Trenton	Underground Storage	15,201,000
Sun Oil Company	Wayne	Wayne	Underground Storage	29,280,000
Marathon Oil Company	Wayne	Wayne	Underground Storage	30,831,000
Phillips Petroleum Company	Wayne	Wyandotte	Underground Storage	8,400,000
Wyandotte Chemical Corp.	Wayne	Wyandotte	Underground Storage	4,500,000

TOTAL PRIMARY STORAGE BY COUNTY, GALLONS LPG	
Bay	155,200
Gratiot	120,000
Hillsdale	294,000
Kent	59,040,748
Macomb	150,000
Midland	8,820,000
St. Clair	450,000
Washtenaw	450,000
Wayne	88,212,000
Combined Primary Storage	157,691,948

TOTAL PRIMARY STORAGE, GALLONS LPG	
Refinery Storage	275,200
Gas Plant Storage	1,344,000
Underground Storage	156,072,748
Combined Primary Storage	157,691,948

LPG underground storage reservoirs are in man-made caverns dissolved from Salina Group (Silurian) salt beds. The depth to storage reservoir salt beds varies with locality within the state.

(1) Skelly Oil Co. discontinued use of this facility in 1966.

Data updated May, 1971

* * MICHIGAN OIL REFINERIES * *

COMPANY	REFINERY LOCATION	NOMINAL CAPACITY* BBLS. DAY
Bay Refining, Division Dow Chemical Company	Bay City	17,000
Crystal Refining Company	Carson City	6,200
Lakeside Refining Company	Kalamazoo	4,000
Leonard Refineries, Inc.		
Leonard Division	Alma	29,000
Roosevelt Division (shut down, 1970)	Mt. Pleasant	(1) (7,500)
Marathon Oil Company	Detroit	50,000
Naph-Sol Refining Company (shut down, 1968)	Muskegon	(1) (10,000)
Osceola Refining Company	West Branch	6,000
Petroleum Specialties, Inc. (shut down)	Flat Rock	(1) (6,500)
Socony Mobil Oil Company	Trenton	40,700
	Total Refinery Capacity	152,900

(1) Not included in total refinery capacity.

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

PART 3, CUMULATIVE RECORDS
EXPLANATION

Part 3 contains cumulative statistics principally of oil and gas production, well completions, and oil field brine production and disposal from 1925 through the most recent year-end compilations.

OIL AND GAS PRODUCTION TABLES. Oil and gas production figures for individual years prior to 1960 can be found in issues of "Summary of Operations, Oil and Gas Fields" for 1962 and prior years, and in "Michigan's Oil and Gas Fields" 1963 to present. The tables show the year of the first recorded production from a particular formation, and the yearly and cumulative production totals from 1925 through the most recent year-end compilations. Cumulative oil and gas production by county is shown on a separate table. Refer to Part 1 for county production figures for the past year, and prior issues for previous years.

CUMULATIVE WELL COMPLETIONS. These tables show the cumulative number of yearly completions in a county. Well density figures include field development wells, exploratory wells, and service wells of all types.

DRILLING PERMITS, WELL COMPLETIONS, FIELDS DISCOVERED. These tables show the number of drilling permits issued by year from 1927 through the most recent year-end compilations. Initial classification of well completions by year, the number of new fields or pools discovered, and the number of producible oil or gas wells on a yearly basis are all shown on the same table.

BRINE PRODUCTION AND DISPOSAL. Oil field brine production records prior to 1937 are incomplete. This table shows the reported amount of produced brine and the method of disposal from 1937 to present. Most oil field brine is now returned to subsurface formations. Small quantities are used for dust control or ice and snow removal on county roads in local areas. A small amount of brine is also disposed in burning pits. Brine production and disposal figures should not be considered entirely accurate.

SERVICE WELLS. Service wells as listed in this publication are those wells which were drilled to serve some purpose other than the initial production of oil or gas. Oil or gas wells are sometimes converted to salt water disposal, observation, or facility wells in gas storage or pressure maintenance projects. There are several types of service wells:

LPG Wells. These are wells drilled for underground storage of liquified petroleum gas. In Michigan, these storage reservoirs are in man-made cavities in salt beds. The cavities have been made by dissolving the salt with water and then pumping out the brine.

Gas Storage Wells. These are wells drilled in gas storage reservoirs. They are frequently referred to as facility wells, and are generally used to inject gas into or extract gas from the reservoir. Certain facility wells may sometime in the history of the field be used as salt water disposal wells or observation wells.

Observation Wells. Most observation wells are related to gas storage projects. They are used to observe underground movement of gas, brines, and other fluids, or to observe pressures.

Brine Disposal Wells. These wells are used in the disposal of oil and gas field brines back into some suitable subsurface formation. Brine disposal well permits are issued for these wells.

Injection and Pressure Maintenance Wells. These are wells used in secondary recovery, or pressure maintenance projects. They may be new wells drilled specifically for injection or pressure maintenance, or they may be converted oil or gas wells; their status can change from time to time.

Oil or gas wells are sometimes converted to salt water disposal, observation, facility wells in gas storage reservoirs, or water injection wells used in secondary recovery or pressure maintenance projects. The types of service wells listed under "Classification of Well Completions" does not include oil or gas wells converted to service wells.

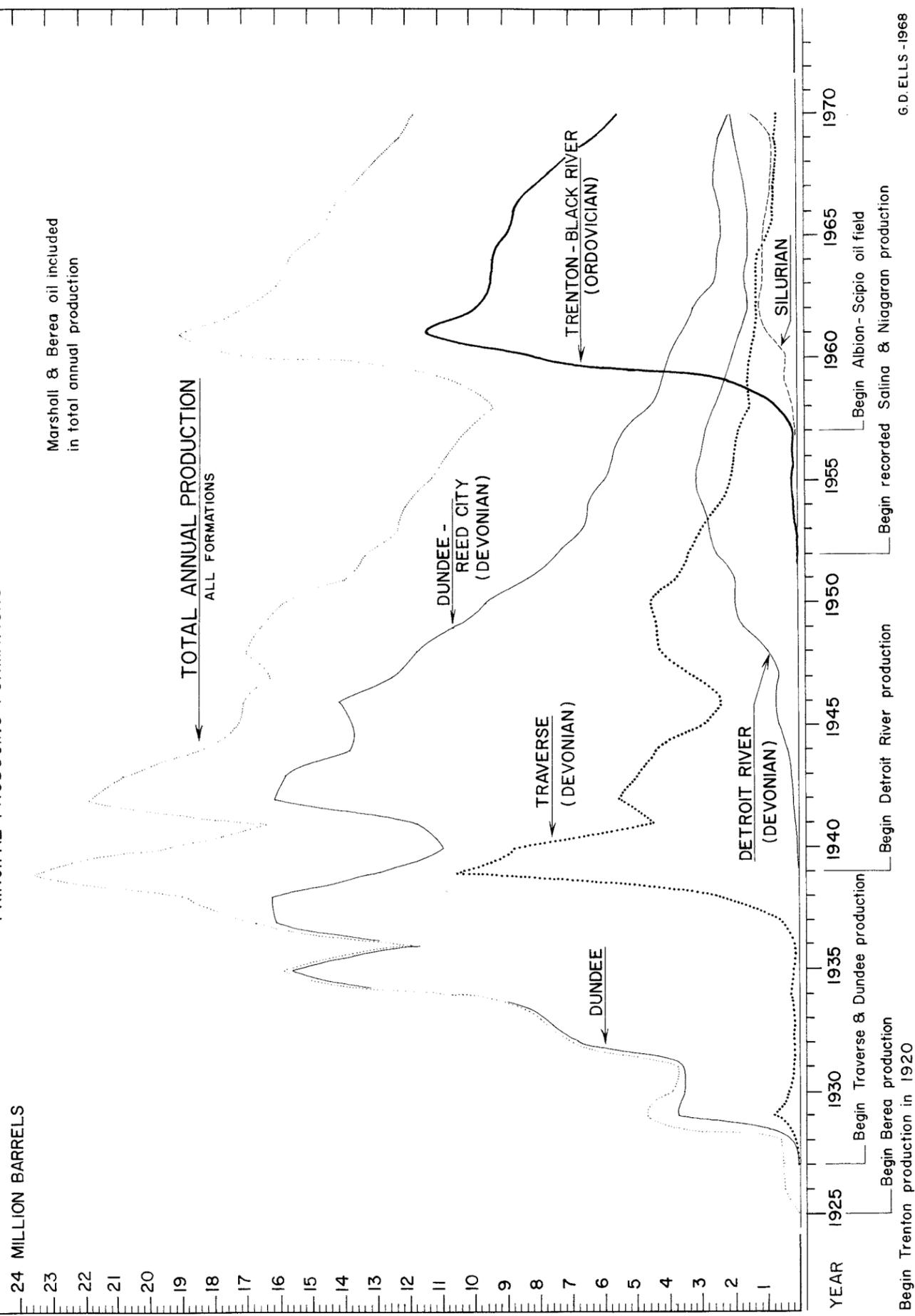
TESTS REPORTED TO HAVE PENETRATED PRECAMBRIAN ROCK IN THE SOUTHERN PENINSULA OF MICHIGAN

PERMIT		PRECAMBRIAN	TOTAL DEPTH	YEAR COMPLETED
26112	Berrien Co. Berrien Twp.	10-6S-17W Security Oil & Gas Thalman #1	4604 (-3800)	1965
23478	Charlevoix Co. Peaine Twp.	6-37N-10W McClure Oil Co. State-Beaver Island #2	4718 (-3977)	1961 - Age Biotite 1100 Feldspar 1110
23435	Charlevoix Co. Peaine Twp.	27-38N10W McClure Oil Co. State-Beaver Island #1	4566 (-3888)	1961
10448	Lenawee Co. Riga Twp.	32-8S-5E Walter H. Eckert Harry Taylor #1	3865 (-3150)	1944
27986	Livingston Co. Osceola Twp.	11-3N-5E Mobil Oil Corp. H. J. Messmore #1	7150?(-6170)	1970
11221	Monroe Co. Berlin Twp.	29-5S-10E Joseph W. Sturman D.L. & R.L. Chapman #1	3342 (-2745)	1945
7702	Monroe Co. Ida Twp.	19-7S-7E Jacob Beck Mrs. James Sancrant #1	3595 (-2926)	1954
25494	Monroe Co. Summerfield Twp.	16-7S-6E Ferguson & Garrison Merlin Shimp #1	3637 (-2951)	1964
27199	Presque Isle Co. North Allis Twp.	29-35N-2E Pan American Petro. Corp. D. E. Draysey #1	5877 (-5069)	1968
BD139	St. Clair Co. Casco Twp.	31-4N-15E Consumers Power Co. Consumers Power Co. BD#1	4605 (-3989)	1964
25780	St. Clair Co. Clay Twp.	Projected L. Bernhardt 17-2N-16E Puzzuoli #1	4152 (-3572)	1965
196	St. Clair Co. St. Clair Twp.	26-5N-16E St. Clair Oil & Gas Corp. Hurst #1	4730 (-4080)	1929 - Age Biotite 1020
10792	Washtenaw Co. Salem Twp.	27-1S-7E I. C. Chamness Troy-Roddenberry Comm. #1	6075 (-5189)	1944
10141	Washtenaw Co. Salem Twp.	16-1S-7E Colvin & Assoc. & Elec. Wm. F. Voss Comm. #1	6374 (-5459)	1944 - Age Biotite 950
11341	Washtenaw Co. Superior Twp.	12-2S-7E Colvin & Assoc. & Rot. St. Viola Meinzinger #1	5670 (-4852)	1945 - Age Biotite 1050
BD146	Wayne Co., City of Woodhaven	22-4S-10E Marathon Oil Co. Woodhaven BD#1	3704 (-3095)	1969
10430	Wayne Co. Huron Twp.	16-4S-9E Colvin & Assoc. & Elec. Theisen Estate #1	3985 (-3360)	1944
25099	Ogemaw Co. Foster Twp.	28-24N-2E Brazos Oil & Gas et al State-Foster #1	Trenton 9766 (-8290)	12,966 (-11520) Cambrian

DEEPEST EXPLORATORY WELL DRILLED IN MICHIGAN

TRENDS IN MICHIGAN OIL PRODUCTION

PRINCIPAL PRODUCING FORMATIONS



Begin Trenton production in 1920

Begin Traverse & Dundee production

Begin Detroit River production

Begin Albion-Scipio oil field

Begin recorded Salina & Niagaran production

TABLE 10 OIL PRODUCTION BY GEOLOGIC SYSTEM AND FORMATION - 1970 AND PRIOR YEARS

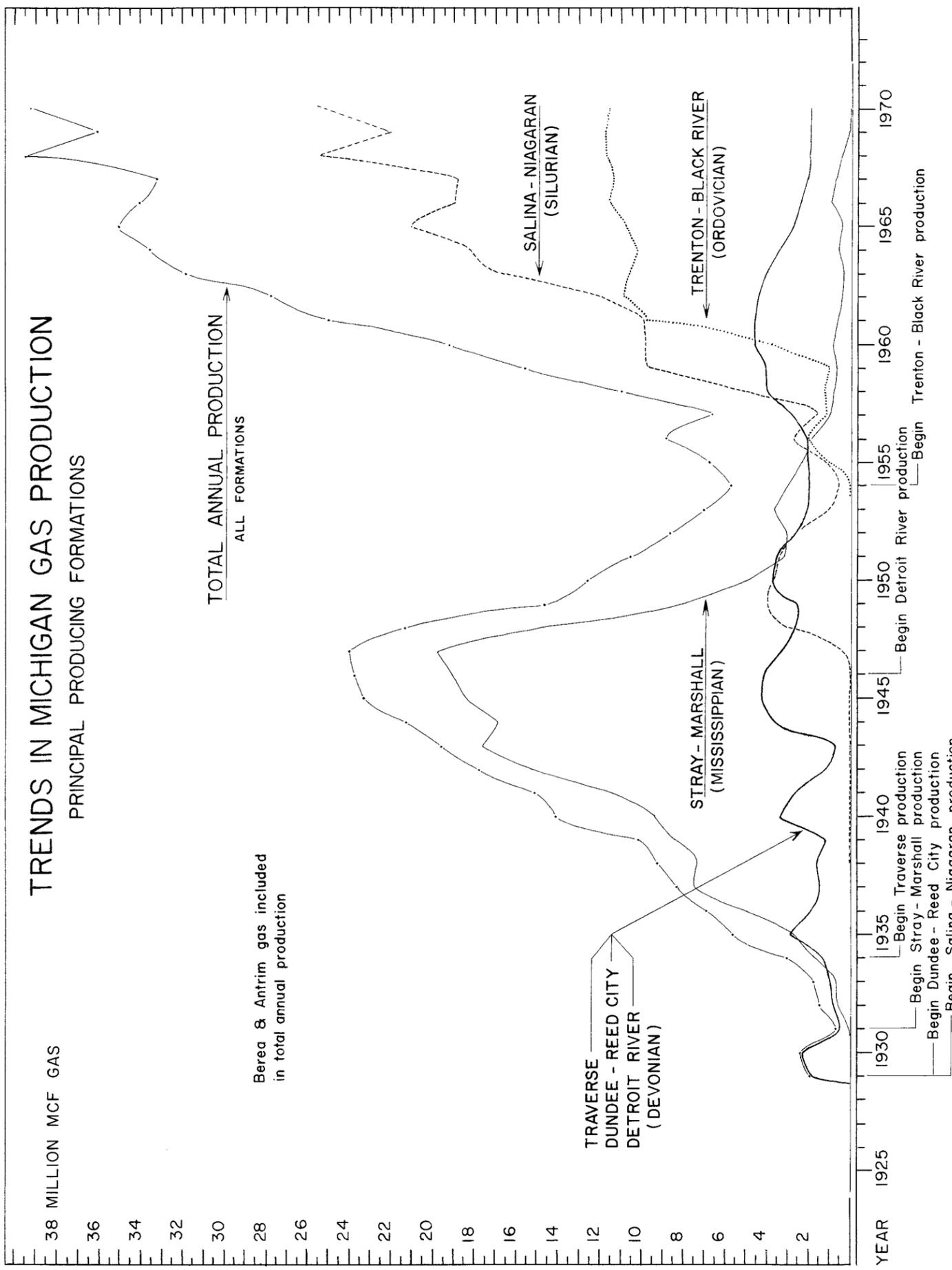
Y E A R	These data include estimates for multiple pay wells and leases when an accurate breakdown was not available										
	MISSISSIPPIAN			DEVONIAN			SILURIAN		ORDOVICIAN		Total Barrels Oil All Formations
	Marshall	Berea	Traverse	Dundee- Reed City	Detroit River	Salina- Niagara	Trenton- Black River				
	First Year of Recorded Oil Production by Formation										
1938	1925	1927	1927	1939	1952	1935					
1925 Through 1929	(Cumulative)	876,559	873,777	4,017,451							5,767,787
1930 Through 1934	(Cumulative)	318,171	995,439	31,870,671							33,184,281
1935 Through 1939	7,411 (Cumulative)	310,313	13,814,816	72,339,293	14,000			43,565			86,529,398
1940 Through 1944	22,040 (Cumulative)	229,262	27,856,377	67,939,211	727,418			348,477			97,122,785
1945 Through 1949	17,283 (Cumulative)	166,687	16,914,771	62,438,443	4,302,309			106,510			83,946,003
1950 Through 1954	9,068 (Cumulative)	125,089	16,974,863	38,058,703	11,878,669	43,091		225,180			67,314,663
1955 Through 1959	8,183 (Cumulative)	110,639	8,788,785	25,618,934	13,716,790	568,085		3,108,341			51,920,757
1960 Through 1964	6,090 (Cumulative)	84,222	6,777,853	15,725,957	8,260,636	4,611,123		48,022,216			83,488,097
1965 Through 1969	5,293 (Cumulative)	113,898	3,851,321	12,186,197	8,387,775	4,195,694		39,132,615			67,852,793
1970	1,161	26,689	670,068	2,079,935	2,014,461	1,412,079		5,489,095			11,693,488

TABLE 11 CUMULATIVE OIL PRODUCTION BY GEOLOGIC SYSTEM AND FORMATION - 1970 AND PRIOR YEARS

Y E A R	These data include estimates for multiple pay wells and leases when an accurate breakdown was not available										
	MISSISSIPPIAN			DEVONIAN			SILURIAN		ORDOVICIAN		Total Barrels Oil All Formations
	Marshall	Berea	Traverse	Dundee- Reed City	Detroit River	Salina- Niagara	Trenton- Black River				
	First Year of Recorded Oil Production by Formation										
1938	1925	1927	1927	1939	1952	1935					
1925 Through 1929		876,559	873,777	4,017,451							5,767,787
1930 Through 1934		1,194,730	1,869,216	35,888,122							38,952,068
1935 Through 1939	7,411	1,505,043	15,684,032	108,227,415	14,000			43,565			125,481,466
1940 Through 1944	29,451	1,734,305	43,540,409	176,166,626	741,418			392,042			222,604,251
1945 Through 1949	46,734	1,900,992	60,455,180	238,605,069	5,043,727			498,552			306,550,254
1950 Through 1954	55,802	2,026,081	77,430,043	276,663,772	16,922,396	43,091		723,732			373,864,917
1955 Through 1959	63,985	2,136,720	86,218,828	302,282,706	30,640,186	611,176		3,832,073			425,785,674
1960 Through 1964	70,075	2,220,942	92,996,681	318,008,663	38,900,822	5,222,299		51,854,289			509,273,771
1965 Through 1969	75,368	2,334,840	96,848,002	330,194,860	47,288,597	9,417,993		90,986,904			577,126,564
1970	76,529	2,361,529	97,518,070	332,274,795	49,303,058	10,830,072		96,475,999			588,820,052

TRENDS IN MICHIGAN GAS PRODUCTION

PRINCIPAL PRODUCING FORMATIONS



G.D. ELLS - 1968

TABLE 12 GAS PRODUCTION BY GEOLOGIC SYSTEM AND FORMATION - 1970 AND PRIOR YEARS

Y E A R	MISSISSIPPIAN		DEVONIAN		SILURIAN		ORDOVICIAN		Total MCF Gas All Formations	
	Stray- Marshall	Berea	Antrim Shale	Traverse	Dundee- Reed City	Detroit River	Salina- Niagara	Trenton- Black River		
1925										
1930										
1935										
1940										
1945										
1950										
1955										
1960										
1965										
1970										
1925 Through 1929					1,887,732				74,867	1,962,599
1930 Through 1934		3,001,963		3,744	6,034,206				61,578	9,101,491
1935 Through 1939				69,894	8,862,165				6,331	41,098,937
1940 Through 1944				3,716,132	7,647,510				79,983	87,803,445
1945 Through 1949	8,020	80,217,680	1,467,460	52,495	1,414,004	15,710,636	793,763	7,393,744		107,057,802
1950 Through 1954	0	18,033,449	916,202	55,626	1,913,497	5,361,578	6,997,257	11,316,082	10,725	44,604,416
1955 Through 1959	0	6,834,419	148,085	56,686	266,623	2,287,066	12,539,252	20,117,524	6,609,393	48,859,048
1960 Through 1964	0	2,874,824	42,020	156,485	876,356	1,117,064	19,252,334	66,799,392	45,443,994	136,562,469
1965 Through 1969	0	2,636,857	814,223	220,305	454,198	150,659	10,649,603	106,149,601	57,253,914	178,329,360
1970	0	73,219	108,526	159,890	82,194	73,917	1,832,213	25,419,973	11,502,081	39,252,013

1925 Through (Cumulative-5 year interval) 1,887,732 74,867 1,962,599

1930 Through (Cumulative-5 year interval) 3,001,963 3,744 6,034,206 61,578 9,101,491

1935 Through (Cumulative-5 year interval) 30,769,471 69,894 8,862,165 6,331 41,098,937

1940 Through (Cumulative-5 year interval) 70,498,989 3,716,132 7,647,510 79,983 87,803,445

1945 Through (Cumulative-5 year interval) 80,217,680 1,414,004 15,710,636 793,763 7,393,744 107,057,802

1950 Through (Cumulative-5 year interval) 18,033,449 1,913,497 5,361,578 6,997,257 11,316,082 44,604,416

1955 Through (Cumulative-5 year interval) 6,834,419 266,623 2,287,066 12,539,252 20,117,524 48,859,048

1960 Through (Cumulative-5 year interval) 2,874,824 876,356 19,252,334 66,799,392 45,443,994 136,562,469

1965 Through (Cumulative-5 year interval) 2,636,857 454,198 10,649,603 106,149,601 57,253,914 178,329,360

1970 73,219 82,194 1,832,213 25,419,973 11,502,081 39,252,013

TABLE 13 CUMULATIVE GAS PRODUCTION BY GEOLOGIC SYSTEM AND FORMATION - 1970 AND PRIOR YEARS

Y E A R	CENOZOIC		MISSISSIPPIAN		DEVONIAN			SILURIAN		ORDOVICIAN		Cumulative MCF All Formations
	Glacial Drift	Stray- Marshall	Berea	Antrim Shale	Traverse	Dundee- Reed City	Detroit River Formation	Salina- Niagaran	Trenton- Black River	1954		
										1949	1931	
1925 Through 1929												1,962,599
1930 Through 1934		3,001,963			3,744	7,921,938					74,867	11,064,090
1935 Through 1939		33,771,434	1,391,076		73,638	16,784,103					142,776	52,163,027
1940 Through 1944		104,270,423	7,251,907		3,789,770	24,431,613					222,759	139,966,472
1945 Through 1949	8,020	184,488,103	8,719,367	52,495	5,203,774	40,142,249	793,763	7,616,503				247,024,274
1950 Through 1954	8,020	202,521,522	9,635,569	108,121	7,117,271	45,503,827	7,791,020	18,932,585			10,725	291,628,690
1955 Through 1959	8,020	209,355,971	9,783,654	164,807	7,383,894	47,790,893	20,330,272	39,050,109			6,620,118	340,487,738
1960 Through 1964	8,020	212,230,795	9,825,674	321,292	8,260,250	48,907,957	39,582,606	105,849,501			52,064,112	477,050,207
1965 Through 1969	8,020	214,867,652	10,639,897	541,597	8,714,448	49,058,616	50,232,209	211,999,102			109,318,026	655,379,567*
1970	8,020	214,940,871	10,748,423	701,487	8,796,642	49,132,533	52,064,422	237,419,075			120,820,107	694,631,580

*Does not include 3,050,143 mcf of unassigned gas from early records.

TABLE 14. CUMULATIVE OIL AND GAS PRODUCTION BY COUNTY THROUGH 1970

COUNTY	CUMULATIVE PRODUCTION		COUNTY	CUMULATIVE PRODUCTION	
	Barrels Oil	MCF Gas		Barrels Oil	MCF Gas
Alliagan	19,399,288	30,790,968	Oceana	15,025,048	1,172,788
Arenac	45,729,202	6,722,136	Ogemaw	17,057,951	8,390,350
Barry	664,559	0	Osceola	53,616,220	45,124,557
Bay	19,511,165	7,857	Oscoda	35,904	0
Berrien	29,757	0	Otsego	300,439	693,661
Calhoun	28,373,950	41,634,547	Ottawa	8,719,846	3,286,558
Cass	103,121	0	Presque Isle	2,805	0
Clare	35,068,602	56,762,729	Roscommon	11,426,302	13,130,001
Clinton	4,121	0	Saginaw	2,463,840	0
Crawford	6,497,937	15,291,012	Shiawassee	33,467	0
Eaton	340	0	St. Clair	8,960,734	128,672,160
Genesee	143,857	0	Tuscola	2,511,134	0
Gladwin	33,295,173	9,834	Van Buren	12,037,328	0
Gratiot	1,127,957	12,940,487	Washtenaw	769,814	7,518,343
Hillsdale	45,882,128	43,748,763	Wayne	229,160	10,948,906
Huron	60,287	0	Wexford	4,814	924,719
Ingham	6,370	0	54 Counties	588,820,051	*694,631,582
Ionia	381,328	0			
Isabella	52,846,364	33,020,655			
Jackson	20,435,024	23,286,985			
Kalamazoo	28,868	0			
Kalkaska	1,520,614	2,133,910			
Kent	9,690,330	3,753,952			
Lake	2,648,335	182,438			
Lapeer	388,018	175,335			
Lenawee	12,495	153,196			
Livingston	2,946	23,741,734			
Macomb	46,237	45,949,830			
Mason	4,685,599	297,116			
Mecosta	10,253,754	31,081,908			
Midland	66,566,583	12,444,916			
Missaukee	14,869,536	15,157,822			
Monroe	713,445	0			
Montcalm	17,941,731	52,576,247			
Montmorency	7,688	0			
Muskegon	7,941,377	9,759,149			
Newaygo	8,745,280	13,132,272			
Oakland	31,613	13,737			

*Does not include 3,050,143 MCF of unassigned gas from early records. Also not included on Table 13.

TABLE 15 CUMULATIVE WELL COMPLETIONS BY COUNTY THROUGH 1970 (Sheet 1 of 2)

County	Area of County (including in- land water)	Classification of Completed Wells						Total Com- pletions	Approximate Well Density (All Classes) Wells:Sq. Miles
		Square Miles	Acres	(New Hole)		(does not include reworked wells)			
				Oil Wells	Gas Wells	Service Wells GS - OBS - SWD	Dry Holes		
Alcona	694	444,160					21	1:33	
Allegan	837	535,680	1,305	89	174		1,691	4:1	
Alpena	590	377,600					10	1:59	
Antrim	520	332,800	406	1			36	1:14	
Arenac	369	236,160	74	44			399	2:1	
Barry	571	365,440	458	1			129	1:3	
Bay	451	288,640					215	1:1	
Benzie	342	218,880	9				7	1:49	
Berrien	584	373,760					70	1:7	
Branch	517	330,880					55	1:9	
Calhoun	716	458,240	236	14			300	1:1	
Cass	505	323,200	30				125	1:3	
Charlevoix	451	288,640					11	1:41	
Cheboygan	798	510,720					18	1:44	
Chippewa	1,651	1,056,640					4	1:413	
Clare	577	369,280	384	172	440		362	2:1	
Clinton	573	366,720	4				79	1:7	
Crawford	566	362,240	84	1	8		25	1:7	
Delta	1,202	769,280					1	1:1200	
Eaton	572	366,080	1				32	1:17	
Emmet	477	305,280					5	1:95	
Genesee	649	415,360	25				43	1:10	
Gladwin	512	327,680	736				263	2:1	
Grand Traverse	490	313,600		6			14	1:25	
Gratiot	566	362,240	46	74	20		266	1:1	
Hillsdale	604	386,560	250	2			455	1:1	
Huron	824	527,360	5				75	1:1	
Ingham	560	358,400	1				19	1:10	
Ionia	578	369,920	9				80	1:28	
Iosco	563	360,320					26	1:6	
Isabella	573	366,720	656	161	33		473	1:22	
Jackson	717	458,880	136	3			254	2:1	
Kalamazoo	580	371,200	18				109	1:2	
Kalkaska	573	366,720	25	9			53	1:5	
Kent	868	555,520	461	6	1	8	347	1:7	
Lake	577	369,280	49	1			823	1:1	
							208	1:3	

TABLE 15 CUMULATIVE WELL COMPLETIONS BY COUNTY THROUGH 1970 Continued (Sheet 2 of 2)

Lapeer	662	423,680	26				62	88	1:8
Leelanau	374	239,360					9	9	1:42
Lenawee	760	486,400	3	72			104	179	1:4
Livingston	583	373,120	1	24	55		79	159	1:4
Luce	929	594,560					2	2	1:465
Mackinac	1,081	691,840					2	2	1:541
Macomb	481	307,840	5	44	12		302	363	1:1
Manistee	568	363,520		1			31	32	1:18
Mason	505	323,200	126	7			295	428	1:1
Mecosta	570	364,800	128	196	183		402	909	2:1
Midland	523	334,720	899	2		2	273	1,176	2:1
Missaukee	572	366,080	178	63	102		211	554	1:1
Monroe	564	360,960	45				112	157	1:4
Montcalm	720	460,800	381	221	190		581	1,373	2:1
Montmorency	567	362,880	3	1			17	21	1:27
Muskegon	519	332,160	443	120			388	951	2:1
Newaygo	867	554,880	200	46	76		386	708	1:1
Oakland	899	575,360	6	6			65	77	1:12
Oceana	541	346,240	331	7			523	861	2:1
Ogemaw	580	371,200	503	21	1		168	693	2:1
Osceola	585	374,400	344	114	172		368	998	1:1
Oscoda	568	363,520	2				10	12	2:1
Otsego	538	344,320	7	27			41	75	1:47
Ottawa	572	366,080	473	19	2		493	987	1:7
Presque Isle	678	433,920	1				17	18	2:1
Roscommon	573	366,720	180	14			103	297	1:38
Saginaw	814	520,960	378	2			174	554	1:2
Sanilac	961	615,040					51	51	1:1
Schoolcraft	1,229	786,560					2	2	1:19
Shiawassee	540	345,600	9				56	65	1:615
St. Clair	751	480,640	260	178	23		828	1,289	1:8
St. Joseph	518	331,520					16	16	2:1
Tuscola	820	524,800	152	2			103	257	1:32
Van Buren	615	393,600	722				996	1,718	1:3
Washtenaw	723	462,720	10	18	5	1	101	135	3:1
Wayne	625	400,000	12	24	17	28	54	135	1:5
Wexford	570	364,800	1	4			58	63	1:5
73 Counties	47,342	Totals:	11,237	1,817	1,514	39	13,713	28,320	1:9

Total includes gas storage, observation, salt water disposal, water injection wells, and brine wells.

TABLE 16 PERMITS, DISCOVERIES, WELL COMPLETIONS, WELLS AT END OF YEAR, 1970 AND PRIOR YEARS (Sheet 1 of 2)

Year	Permits Issued	Classification of Well Completions					Fields or Pools Discovered		Wells at End of Year				
		Oil Wells		Service Wells		Dry Holes	Total Completions	Oil	Gas	GS	OBS	Inj.* P.M.	LPG*
		Gas Wells	GS-OBS-SWD	LPG	Oil Wells								
1925	0	3				3	1						
1926	0	89			16	105	1						
1927	16	218	3		46	267	1						
1928	283	79	30		49	158	1						
1929	576	324	22		137	483	1						
1930	257	154	19		158	331	2						
1931	111	59	17		52	128	1					64	
1932	184	109	10		64	183	1					72	
1933	429	223	10		85	318	3					70	
1934	444	272	47		150	469	3					117	
1935	700	319	101		221	641	1					212	
1936	777	333	206		268	807	6					402	
1937	973	622	66		267	985	6					442	
1938	996	580	27		411	1,018	17					448	
1939	1,465	845	56		578	1,479	8					485	
1940	1,121	557	59		565	1,181	8					510	
1941	1,044	441	97		413	951	7					577	13
1942	570	297	74		331	682	14					631	13
1943	627	233	47		355	635	12					639	13
1944	741	246	64		400	710	10					651	13
1945	755	271	57	6	467	801	11					663	19
1946	822	223	53	86	461	823	19					547	226
1947	886	318	43	148	387	896	10					534	409
1948	918	371	32	77	437	917	10					502	482
1949	999	439	22	73	473	1,007	21					471	554
1950	901	336	28	47	473	884	18					471	610
1951	744	227	20	43	466	757	16					417	673
1952	694	261	30	51	370	714	14					388	732
1953	824	258	18	110	360	747	11					313	901
1954	573	214	15	2	338	571	18					316	903

Incomplete records from 1925 through 1930

*LPG injection and extraction wells in LPG storage facilities.

TABLE 16 PERMITS, DISCOVERIES, WELL COMPLETIONS, WELLS AT END OF YEAR, 1970 AND PRIOR YEARS Continued (Sheet 2 of 2)

1955	484	204	13	1	291	510	12				4,223	321	904	7
1956	476	196	12	28	227	463	12				4,191	310	932	7
1957	461	176	40	35	207	461	12				4,233	335	977	10
1958	481	166	20	36	227	453	10				4,201	345	1,025	14
1959	727	257	47	72	272	652	8				4,327	323	1,094	18
1960	904	372	19	79	441	912	7				4,555	249	1,337	19
1961	849	207	57	74	476	817	13				4,619	292	1,420	22
1962	711	148	62	53	474	741	5				4,603	300	1,531	26
1963	704	135	72	56	384	650	7				4,598	367	1,601	28
1964	583	82	48	126	376	632	6				4,588	404	1,632	28
1965	494	53	34	107	291	485	6				4,368	424	1,859	28
1966	430	56	45	11	290	404	8				4,315	429	1,896	30
1967	405	69	38	26	287	420	8				4,273	481	1,921	30
1968	378	70	12	30	251	369	9				4,372	414	394	36
1969	379	73	9	26	239	347	7				-----	---	---	36
1970	425	50	16	108*	211	388	11				-----	---	---	39

* All gas storage wells

These data discontinued.
See Tables 3, 4, 5, and 7.

STRATIGRAPHIC SUCCESSION IN MICHIGAN

PALEOZOIC THROUGH RECENT

ERA		SYSTEM		SERIES		STAGE	
CENOZOIC	QUATERNARY	RECENT		Valders Stade		Two Creeks Interstade	
		PLEISTOCENE		Wisconsin Glaciation		Mankato Stade (Pl. Huron?)	
				Sangamon Interglaciation		Cary Stade	
				Tazewell Stade			

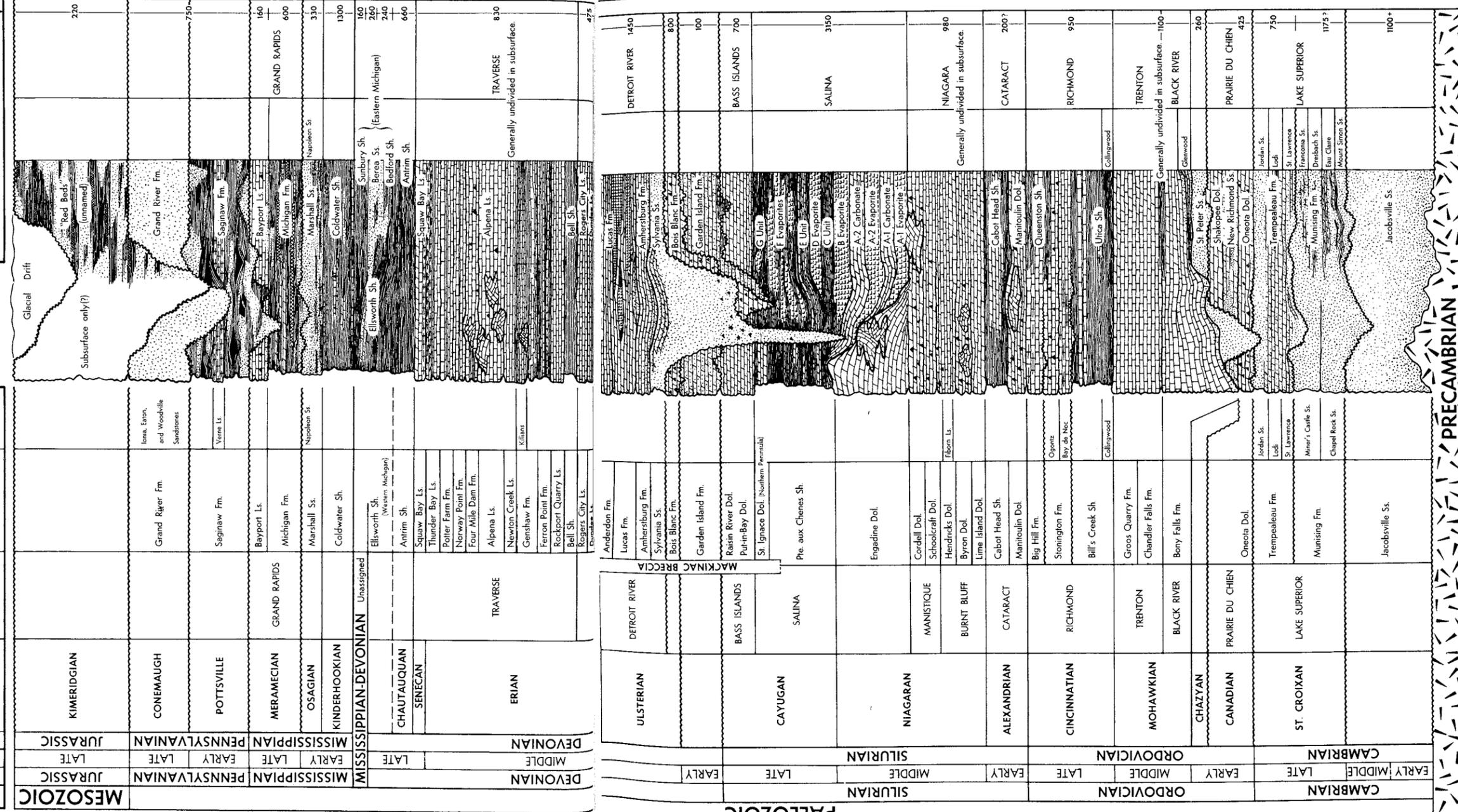
OUTCROP NOMENCLATURE

GEOLOGIC TIME		TIME-STRATIGRAPHIC		ROCK-STRATIGRAPHIC	
ERA	PERIOD	SYSTEM	SERIES	GROUP	FORMATION MEMBER

SUBSURFACE NOMENCLATURE

DOMINANT LITHOLOGY		ROCK-STRATIGRAPHIC		GROUP	
FORMATION	MEMBER	FORMATION	MEMBER	FORMATION	MEMBER

Approximate maximum thickness, in feet, of rock units in the subsurface. NO SCALE



MICHIGAN DEPARTMENT OF CONSERVATION
 Ralph A. MacMillan, Director
 GEOLOGICAL SURVEY
 Gerald E. Eddy, State Geologist

ACKNOWLEDGMENT: Compiled with the counsel of colleagues in this department, the U.S. Geological Survey, Michigan's universities, other state Geological Surveys, and geologists within Michigan's oil and gas industry. Dr. A. W. Cress, Department of Geology, Michigan State University, identified rocks of Mesozoic age and suggested provisional age assignments.

GEOLOGIC NAMES COMMITTEE
 Garland D. Ells, Chairman; Robert W. Kelley, Secretary;
 Harry J. Hardenberg, L. David Johnson, Harry O. Sorenson

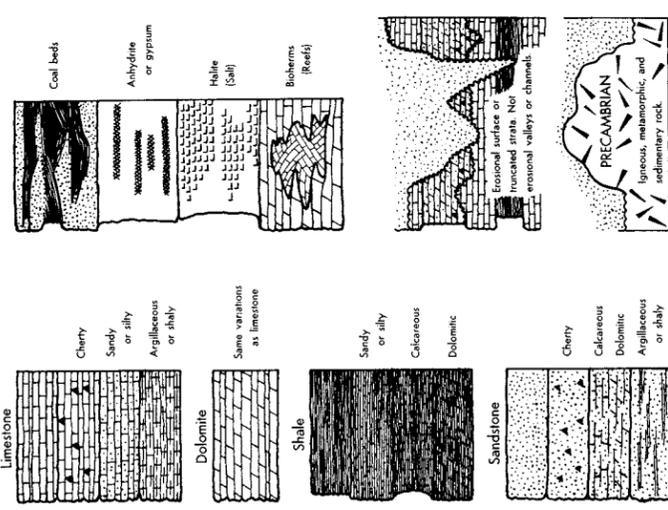
INFORMAL TERMS

Principal oil and gas pays, and informal terms used in petroleum exploration and applied to parts of formations or groups in the subsurface.

STRATIGRAPHIC POSITION	INFORMAL TERMS	PAYS
Basal sandstones of Saginaw Fm.	Parma sandstone	
In lower part of Michigan	ingle sp. Boom line (gray-gray ss) Gray dol. Gray ss.	Gas Gas & Oil Gas & Oil
Marshall Ss.	Coldwater line Weir sand Coldwater red-rock	Gas Gas
In upper part of Ellsworth Sh.	"Berea" (Western Michigan)	Oil & Gas
Berea Ss.	Berea sand (Eastern Michigan)	Oil & Gas
Squaw Bay Ls.	Squaw Bay	Oil & Gas
Upper part of Traverse Group in Western Michigan	Traverse formation Traverse line Slowey Lake zone	Oil & Gas Oil & Gas Oil & Gas
Rogers City Ls.		Oil & Gas
Dundee Ls.		Oil & Gas
Dundee Ls. (?), Upper part of Lucas Fm. (?)	Reed City zone	Oil & Gas
In Lucas Fm.	massive salt big salt sour zone massive anhydrite big anhydrite Richfield zone black line	Oil & Gas Oil & Gas Oil & Gas Oil & Gas
Amherstburg Fm.		Oil & Gas
Part of Salina Group E Unit	E zone (or Kinigh zone)	Oil
Divisions of A-2 Carbonate in Western Michigan	A-2 dolomite A-2 lime	Gas

A-1 Carbonate	A-1 dolomite	Oil & Gas
Upper part of Niagara Series	brown Niagara gray Niagara white Niagara	Oil & Gas
Part of Niagara Series (Eastern Michigan)	Clinton shale	Oil & Gas
Trenton Group		Oil & Gas
Black River Group	Black River formation Black River shale Van Wert zone	Oil & Gas
Oneota Dol.		Oil

EXPLANATION



GEOLOGIC NAMES COMMITTEE: Harry O. Sorenson, Chairman and Ordovician; Robert W. Kelley, Early and Middle Silurian; Garland D. Ells, Late Silurian through Detroit River Group of Devonian age; Harry J. Hardenberg, Dundee Limestone through Traverse Group of Devonian age; L. David Johnson, Antrim Shale through the Pennsylvanian System; T. Wells Terwilliger, general geology of the Cenozoic.

CHART 1
1964

PRECAMBRIAN

PRECAMBRIAN

INDEX

ABBREVIATIONS	Page 76	CUMULATIVE RECORDS EXPLANATION	Page 59
ADVISORY BOARD, OIL AND GAS Inside front cover		DISCOVERY WELLS IN 1970	14-15
AREA OF COUNTIES		Number of fields or pools discovered by years	70-71
Acres	68-69	DRILLED FOOTAGE IN 1970	6
Square miles	68-69	FIELDS	
BRINE		Gas & oil, active, abandoned, locations	21-49
Disposal method or use	21-49,55	General distribution (center spread map)	38-39
Production by field	21-49	Storage, gas	50-51
--by formation	21-49	Storage, gas, undeveloped	52
COMMISSION OF NATURAL RESOURCES, MEMBERS		Storage, gas, location	50-52
. Inside front cover		GAS, NATURAL	
COMPLETIONS, NUMBER OF		Production in 1970	7
--by counties in 1970	10-11	--by counties in 1970	9
--by counties through 1970	68-69	--by counties, cumulative	67
--by year, 1970 and prior years	70-71	--by districts in 1970	7
Development wells in 1970	6	--by fields, cumulative	21-52
Exploratory wells in 1970	6	--by geologic formation	64-66
Gas storage wells in 1970	6	--by months in 1970	7
CONTENTS	1	--by years	64-66
DEEP TESTS IN 1970	16-18		

(Gas, Natural continued)

--oil well gas	Page 21-49	OIL AND GAS DISTRICTS	Page 5
Valuation in 1970	7	OIL AND GAS FIELDS EXPLANATION	19-20
Imports for 1970	7-8	PERMITS	
INJECTION WELLS	55	Issued in 1970	4
LIQUID PETROLEUM GAS		--by districts in 1969	4
Number of LPG storage wells	68-71	--by years	70-71
Primary storage facilities	57	POOLS, OIL AND GAS (See Table 3)	
Production or extraction	56	PRE-CAMBRIAN TESTS, SOUTHERN PENINSULA	60
MISCELLANEOUS OIL WELLS	53	PRORATED FIELDS	54
OIL		REFINERIES	58
Oil gravity (See Table 3)		STATE ACREAGE UNDER LEASE	18
Oil imports and exports	7-8	STRATIGRAPHIC CHART	72
Production		TECHNICAL STAFF Inside back cover	
--by counties in 1970	9	WELL DENSITY BY COUNTY	68-69
--by districts in 1970	7		
--by fields	21-49		
--by geologic formation	61-63		
--by months in 1970	7		
--by years	61-63		
Valuation in 1970	7		

ABBREVIATIONS

A.A.P.G. American Assoc. Petrol. Geol.
 A.P.I. American Petroleum Institute
 (A) I.P. (Acid) Initial Production or Potential
 A-1 Carb. A-1 Carbonate
 A-2 Carb. A-2 Carbonate
 Bbls. Barrels
 B.B. Bois Blanc formation
 B.D. Brine Disposal
 BDW Brine Disposal Well
 BOPD Barrels Oil Per Day
 B.R. Black River
 Camb. Cambrian
 "Camb." Unidentified Cambrian
 Cat. Catabact formation
 c.f.p.b. Cubic feet per barrel
 C.H. Cabot Head formation
 Cinn. Cincinnatian
 Cl. Clinton formation
 Cold. Coldwater formation
 Compl. Completion
 Coop. Cooperative
 D & A Dry and Abandoned
 Dev. Devonian
 D.R. Detroit River formation
 D.R. SZ Detroit River Sour Zone
 Dres. Dresbach formation
 Dd., DD. Dundee
 Dd.-R.C. Dundee-Reed City
 DPT Deeper Pool Test
 E.C. Eau Claire formation
 Explor. Exploratory
 Fran. Franconia formation
 Geo. Test Geological Test
 G.O.R. Gas-Oil Ratio
 Grav. Gravity Gravimeter
 GS Gas Storage
 GSW Gas Storage Service Well
 Gw Glenwood
 Incs. Includes
 Inj. Injection
 L.P.G. Liquid Petroleum Gas

Marshall Formation
 Thousand Cubic Feet
 Thousand Cubic Feet Gas Per Day
 Michigan formation
 Mississippi
 Mt. Simon ss.
 New Field Wildcat
 (Natural) Initial Production or Potential
 Niagan
 Nontechnical
 Observation Well
 Out Post Well
 Ordovician
 Old Well Drilled Deeper
 Prairie du Chien formation
 Pennsylvanian
 Pilot Water
 Pressure Maintenance
 Producing Formation
 Reed City formation
 Reworked Well
 Richfield formation
 Saginaw formation
 Salina-Niagan
 Shut Down
 Seismograph
 Show Oil and Gas
 St. Peter formation
 Michigan Stray formation
 Subsurface geology
 Service Well
 Salt Water Disposal
 Sylvia formation
 Sour Zone (In Detroit River)
 Thickness
 (Treatment) Initial Production or Potential
 Traverse
 Trempealeau formation
 Trenton-Black River
 Unitized

Marsh.
 MCF
 MCFGPD
 Mich.
 Miss.
 M.S.
 NFW
 (N) I.P.
 Niag.
 Nt.
 OBS
 OP
 Ord.
 OWDD
 P.D.C.
 Penn.
 Pilot Wtr.
 P.M.
 Prod. Form.
 R.C.
 RW
 Rich.
 Sag.
 Sal.-Niag.
 SD
 Seis.
 SO & G
 S.P.
 Stray
 Sub.
 SW
 SWD
 Sylv.
 SZ
 Thick.
 (T) I.P.
 Trav.
 Trem.
 Trent.-Blk River
 Unit.

 TECHNICAL STAFF AND ORGANIZATION CHART
 Geological Survey Division
 DEPARTMENT OF NATURAL RESOURCES
