THESIS

This is to certify that the

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ORIGIN AND DEVELOPMENT
OF THE
HOWELL ANTICLINE IN MICHIGAN

presented by

Deane Earle Kilbourne

has been accepted towards fulfillment
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Major professor

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THE ORIGIN AND DEVELOPMENT OF THE HOWELL ANTICLINE IN MICHIGAN

BY

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THE ORIGIN AND DEVELOPMENT OF THE HOWELL ANTICLINE IN MICHIGAN

INTRODUCTION

The Howell anticline, the largest and most pronounced structural unit in the Michigan synclinorial basin, is believed to be the result of deep subsurface, normal faulting expressed upward in the form of an anticline.

Absence of outcrops within the area delayed the discovery of the anticline until the late twenties, although its presence was suspected by Lane (1895, p. 62) as early as 1894. Shows of oil and gas led several geologists to believe it should be tested as a potential producer of oil and gas. Exploration did not proceed until it was recognized that the Saginaw formation (Robinson, 1920, p. 117), as shown in early geological maps of Michigan, did not extend continuously across the region. A structure was indicated when this reentrant in the younger rocks was found.

Location of the Area. The main part of the structure described in this report is about forty miles northwest of Detroit in Livingston County (Figure 1.)

Purpose of the Study. The Howell structure has been the subject of study by several previous workers, Smith (1914, pp. 162-165), Newcombe (1933, pp. 205-210), Kesk (1938, pp. 463-476), and Gibbs (1939). The purpose of this

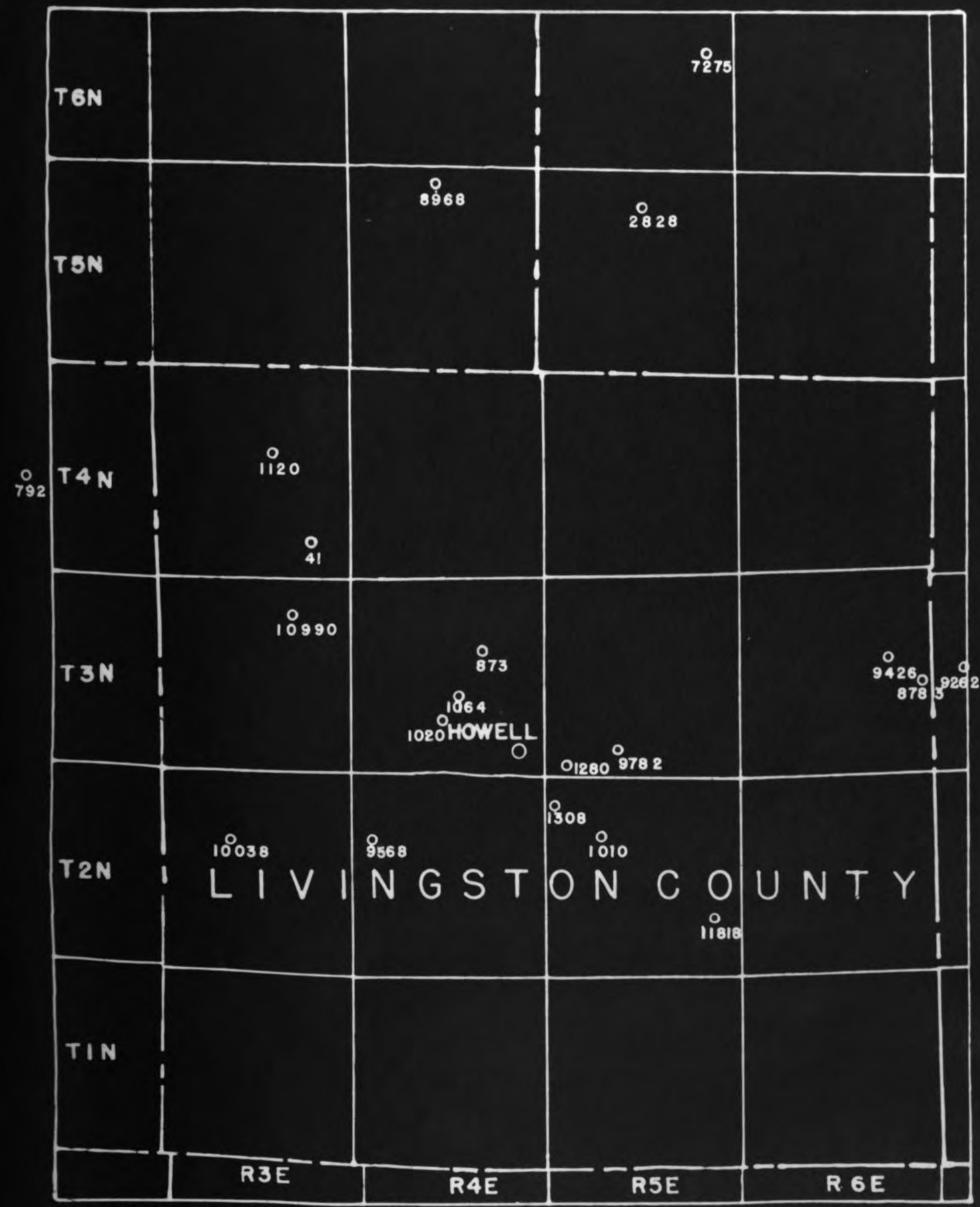


FIGURE 2. MAP OF LIVINGSTON COUNTY AND ADJACENT AREA SHOWING LOCATION OF WELLS BY PERMIT NUMBER

0 SCALE 4 MILES

investigation was to determine if the Howell Anticline is (1) the upward reflection of a buried hill, (2) the result of tangential compressive forces acting from the northeast, or (3) the product of deep subsurface faulting.

Method of Investigation. The absence of outcrops in Livingston County necessitated an investigation based on the records and samples of deep borings (Figure 2). To study the structure it was necessary first to outline the stratigraphy, in order that key beds might be contoured to show structure, and then to establish the sedimentary and structural history of the area by means of isopachous maps. The term isopach is derived from the two Greek words "iso" for equal and "pach" for thickness.

An attempt was made to delineate formational boundaries by heavy mineral separations and insoluble residue studies. In-as-much as they did not add materially to the stratigraphic knowledge these methods were abandoned.

Physiography. The surface features of Livingston County consist mainly of moraines and outwash plains, which were deposited in the Wisconsin stage of the Pleistocene Epoch. Surface elevations range from 800 feet in the northwestern part of the county to more than 1000 feet in the southeastern part.

The drainage of Livingston County is in three direct-

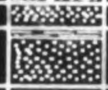
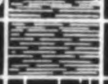
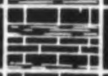
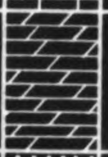
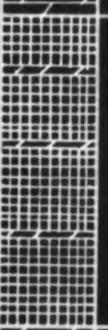
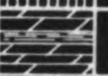
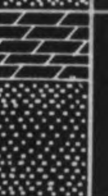
SYSTEM	FORMATION	COLUMNAR SECTION	MAXIMUM THICKNESS IN FEET	DESCRIPTION
PLEISTOCENE			330	GLACIAL DRIFT
PENN.	SAGINAW		?	SANDSTONE
MISSISSIPPIAN	MICHIGAN MARSHALL		73 285	SANDSTONE AND SHALES SANDSTONE
	COLDWATER SUNBURY		990	SHALE, GREY WITH SANDY SHALE NEAR BASE. SHALE, BLACK
	BEREA-BEDFORD		207	SANDSTONE— SHALE, GREY
DEVONIAN	ANTRIM		207	SHALE, BLACK, BITUMINOUS
	TRAVERSE		354	LIMESTONE AND SHALE, INTERBEDDED
	DUNDEE		278	LIMESTONE, BUFF
	DETROIT RIVER		713	DOLOMITE
	SYLVANIA		358	SANDSTONE, WHITE. FEW THIN DOLOMITE BEDS.
SILURIAN	BASS ISLAND		514	DOLOMITE, CHERTY
	SALINA		1652	SALT INTERBEDDED WITH DOLOMITE, ANHYDRITE, SHALE, AND SOME GYPSUM
	NIAGARAN		329	DOLOMITE AND SHALE
	CATARACT		276	DOLOMITE AND SHALE
ORDOVICIAN	CINCINNATIAN TRENTON ST. PETER		1310+	DOLOMITE AND SHALE LIMESTONE SANDSTONE
CAMBRIAN	UNDIFFERENTIATED		974?	SANDSTONE OVERLAIN BY DOLOMITE

FIGURE 3. GENERALIZED STRATIGRAPHIC COLUMN FOR LIVINGSTON COUNTY

VERTICAL SCALE

0 1000 FEET

ions. The southwestern part of the county drains westward by way of the Red Cedar to the Grand River. A small area in the southeast portion, separated from the Grand River system by a moraine, drains to the south by way of the Huron River. The balance of the county drains to the north by way of the Shiawassee River.

ACKNOWLEDGEMENTS

Acknowledgements are made to Dr. W. A. Kelly of Michigan State College not only for directing the study, but also for criticizing the manuscript. Many thanks are also due to the Michigan Geological Survey, which furnished the maps, logs of wells, and well samples from which the study was made. For their suggestions and criticisms of the manuscript, acknowledgements is made to Mr. G. E. Eddy, Mr. Rex Grant, and Mr. Harry Hardenberg of the Michigan Geological Survey. The manuscript has also been read by Dr. S. G. Bergquist and Mrs. Jane E. Smith of Michigan State College, both of whom offered helpful suggestions for its improvement.

STRATIGRAPHY

The stratigraphy of Livingston County (Figure 3) is similar to that of the eastern half of Michigan. Regionally, the formations thicken toward the center of the state and thin near its borders. They range in age from Cambrian through Pennsylvanian. In Livingston County the formations thicken to the northeast and thin to the southwest.

Cambrian

No wells have penetrated the Cambrian in Livingston County (Cohee, 1947, p. 294), but in sec. 12, T. 2 S., R. 7E., Washtenaw County, which lies just to the south, Colvin and Associates and Rotary Electric Steel drilled the Viola Meinsinger # 1 which penetrated to the granite. In this well a series of sandstone formations totaling 596 feet are correlated with the Cambrian. These are overlain by 378 feet of dolomite also assigned to the Cambrian.

Ordovician

The McPherson well # 1, drilled in sec. 35, T. 3 N., R. 4 E., by the Duck Lake Oil Corporation, penetrated a sandstone correlated with the St. Peter of Lower or Middle Ordovician age (DuBois, 1945, pp. 29-43). Above this sandstone is a series of limestones, dolomites, and shales of the Trenton group and Cincinnatian series of Middle and Upper Ordovican age aggregating 1310 feet in thickness.

Silurian

The Silurian formations have been penetrated in part by three wells, the McPherson mentioned above, the Gerald Bauer # 1 in sec. 25, T. 2 N., R. 5 E., and the E. C. Addison # 1 in sec. 11, T. 3N., R. 3 E., The last two mentioned were drilled by the Panhandle Eastern Pipe Line Company. The Lower Silurian is represented by

the Cataract group in the McPherson well and consists of dolomite and shale totaling 276 feet.

Between the Cataract and the Salina salt series is the Middle Silurian Niagaran series, composed principally of dolomites and shales. The Niagaran series shows a section of 329 feet in the McPherson well. The Addison well shows an incomplete section of 196 feet and the Bauer well shows 177 feet, also incomplete.

The thickest formation of Silurian age is the Salina, consisting of interbedded salt, dolomite, anhydrite, shale, and some gypsum. The thickness varies in the different wells as follows: the McPherson well 1639 feet, the Addison well 1490 feet, the Bauer well 1652 feet. The Norris-Smith-Hoover, Ross Robb # 1 well in sec. 26, T. 4 N., R. 3 E., shows an incomplete section of 1160 feet of the salt series. This indicates a tendency for the salt to thin to the southwest.

The Upper Silurian is represented by the Bass Island formation of cherty dolomite. It varies in thickness from 413 to 514 feet and likewise thins to the southwest.

Devonian

Detroit River Formation. According to Schuchert (1943, p. 605) there is a disconformity between the Silurian and Devonian in which the Lower Devonian is missing. The Middle Devonian begins with the Sylvania sandstone, the basal member of the Detroit River formation. The Sylvania contains several dolomite members and thins

generally northwestward from 358 feet in the Bauer well to 167 feet in the McPherson well and then thickens to 193 feet in the Ross Robb well.

Above the Sylvania is a series of dolomites, which decrease in thickness from 713 feet in the McPherson well to 345 feet in the Addison well.

Dundee Limestone. The Dundee formation is a buff colored high calcium limestone. The insoluble residues consist of shale, sand grains, and cherty aggregates. The amount of residue varies from a trace to ten percent. Shale makes up the most abundant residue, while sand occurs in varying amounts. Eddy (1933, pp. 349-50) has shown that the presence of dolocasts, siliceous aggregates showing the impression of dolomite crystals, is an indication of an unconformity. Few dolocasts were found in the samples studied however. The sand grains are white, some clear, and some frosted. They vary in texture from very fine to coarse with the medium size predominating.

Traverse Formation. The Traverse formation is regarded as being both Middle and Upper Devonian in age (Schuchert, 1943, pp. 611-615). It consists of interbedded shales and limestones, and thins from northeast to southwest. The greatest thickness of the Traverse is in the northeastern portion of the county where it totals 354 feet. It thins, however, to 253 feet in the southwestern part of the county.

Antrim Shale. The Antrim formation is a black to brown, bituminous shale. Near its base is a thin, grey, dolomitic shale member. It ranges in thickness from 290 feet in the northwestern part of the county and thins to 160 feet in the southeast.

E. O. Ulrich (1927, p. 231) has found fossil evidence in the upper part of the Antrim, which he ascribes to the very earliest Mississippian.

Mississippian

Bedford-Berea Formations. The Bedford is composed of grey shale while the Berea comprises fine sandstone. The aggregate thickness of the two formations is 195 feet in the southeast, but thins to 120 feet in the northwest. Many irregularities of the isopachous map suggest that there is an unconformity between the Berea sandstone and the Bedford shale. In some places the Berea rests directly on the Antrim shale, the Bedford being absent. No heavy minerals were found in the Berea sandstone of Livingston County.

The Bedford was originally assigned to the Devonian by A. C. Lane (1909, pp. 73-75). Fossils have not been found in the Bedford, however, if the fossil evidence of Ulrich is accepted the Bedford, which is above the Antrim, must be assigned to the Mississippian.

Sunbury Shale. The Sunbury is a black bituminous shale varying in thickness from five to thirty-eight feet.

Coldwater Formation. The Coldwater is predominantly a grey shale, In a diagonal drawn from the northeast corner to the southeast corner of Livingston County the Coldwater is found to thicken rapidly to a maximum of 975 feet to the southwest of this diagonal and to 395 feet to the northeast. In wells along the trend of the diagonal the maximum thickness is never more than 200 feet. The lithology of the Coldwater along the diagonal is predominantly a sandy facies which becomes a sandstone as well developed as the Berea. The Red facies of the Coldwater shale so common in other parts of Michigan does not appear in Livingston County. The upper part of the Coldwater may have been exposed to weathering and removed by erosion.

Marshall Formation. The Marshall is a white to grey, fine sandstone with thin beds of dolomite. It is found only to the southwest of the above mentioned county diagonal.

Michigan Formation. Sandstone, shale and dolomite up to 73 feet thick are found in Livingston County. These are correlated with the Michigan formation. It is found but in three wells in the county, namely, the Arthur F. Etienne, J. J. Eisner # 1 in sec. 7, T. 2 N., R. 4 E., the J. T. Norris, W. A. Stowe # 1 in sec. 9, T. 2 N., R. 3 E., and the Addison well.

Pennsylvanian

Saginaw Formation. The Saginaw formation has not been reported in any well drilled, thus far, in Livingston County, but has been found in wells just to the west.

Pleistocene

The glacial drift in Livingston County varies in thickness from 92 to 330 feet.

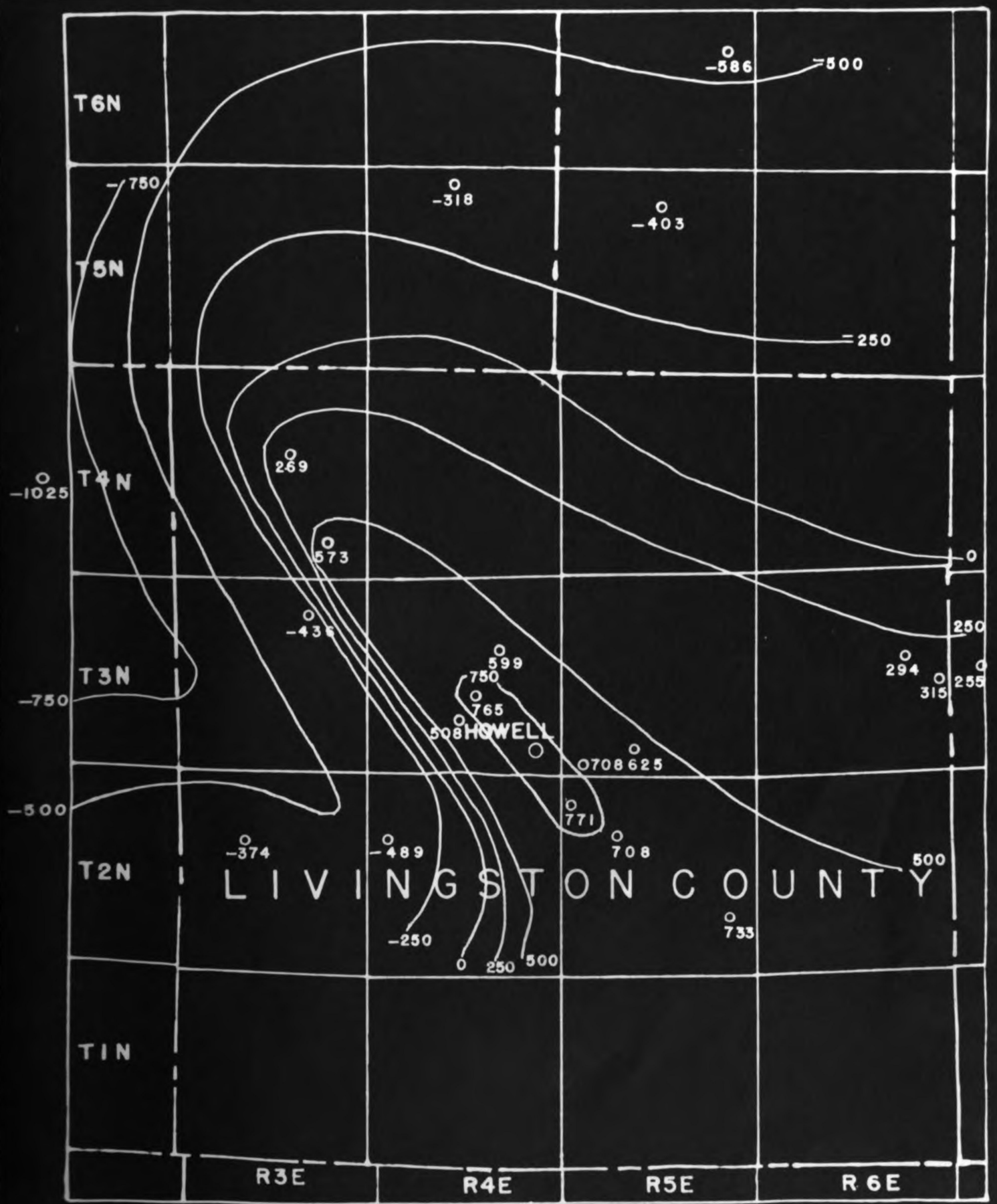


FIGURE 4. STRUCTURE MAP DRAWN ON TOP OF THE BEREA SANDSTONE
DATUM PLANE SEA LEVEL
CONTOUR INTERVAL 250 FEET
SCALE
0 4 MILES

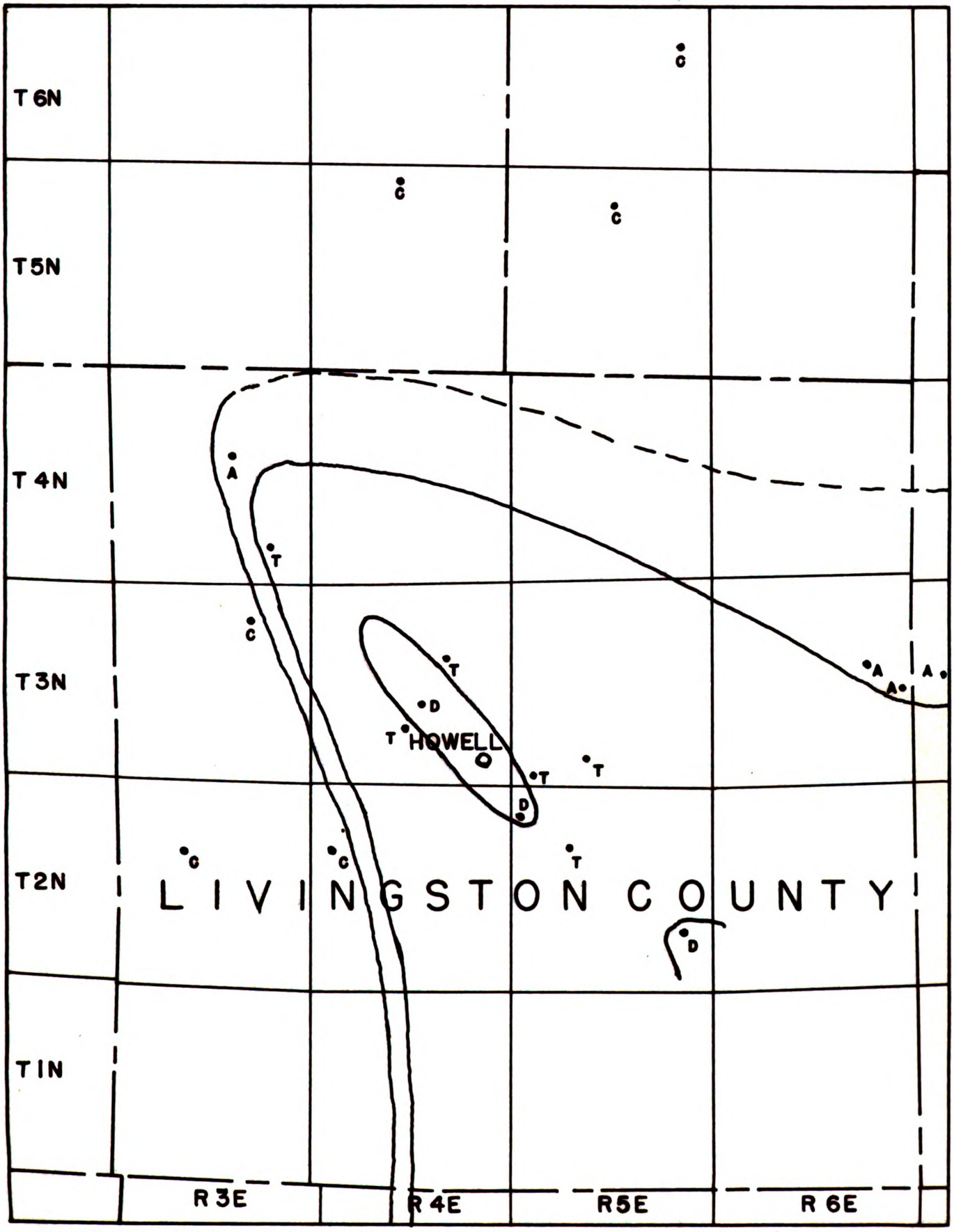


FIGURE 5B. AREAL GEOLOGIC MAP OF LIVINGSTON COUNTY AREA AT SEA LEVEL

0 SCALE 4 MILES

C= COLDWATER SHALE
A= ANTRIM SHALE
T= TRAVERSE FORMATION
D= DUNDEE LIMESTONE

FIGURE 5B. AREAL GEOLOGIC MAP OF LIVINGSTON COUNTY AREA AT SEA LEVEL

FIGURE 5A. GEOLOGIC MAP OF LIVINGSTON COUNTY AREA

SCALE 0 4 MILES

LEGEND

SAGINAW SANDSTONE

MICHIGAN FORMATION

MARSHALL SANDSTONE

COLDWATER SHALE

BEREA SANDSTONE

ANTRIM SHALE

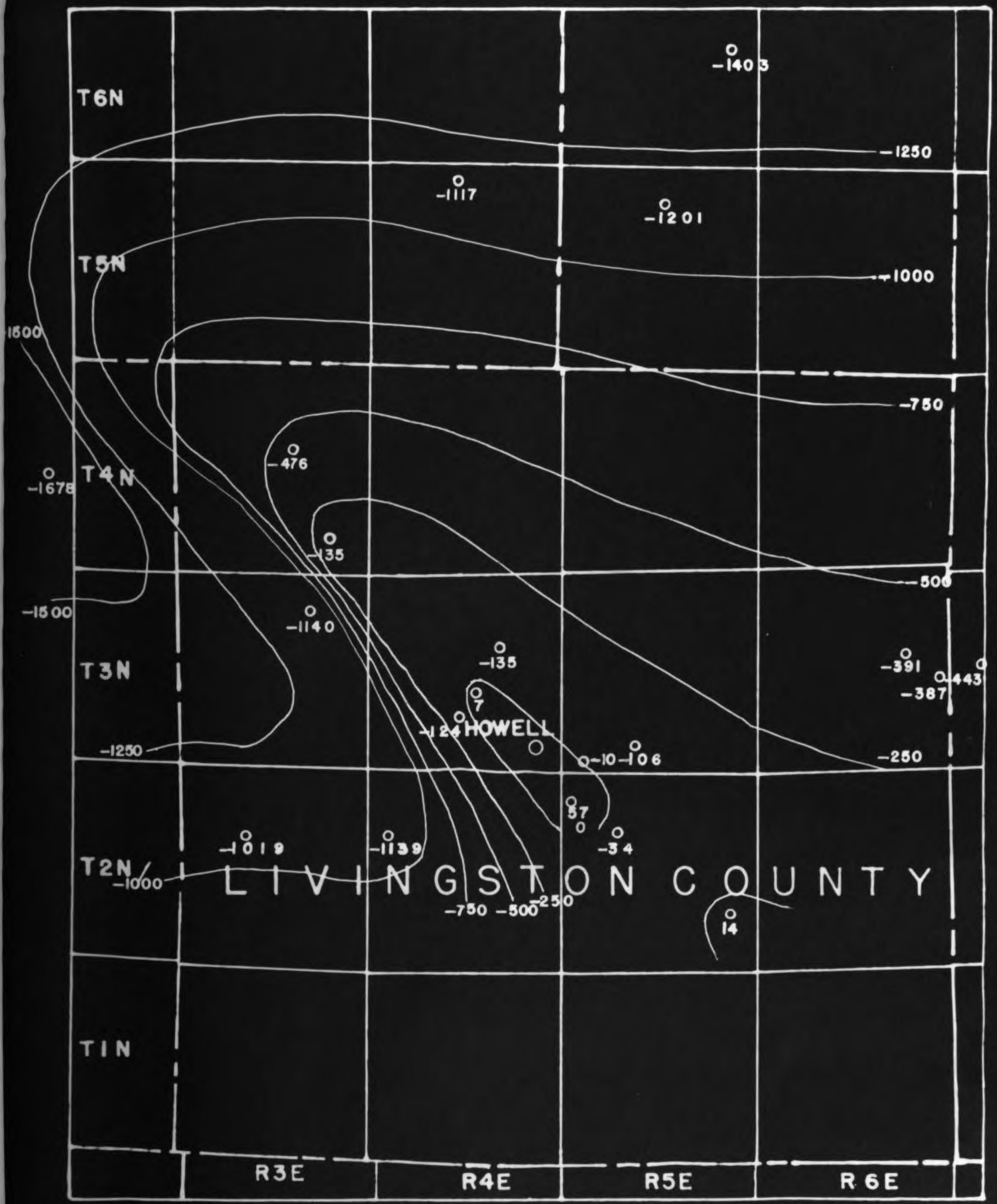


FIGURE 6. STRUCTURE MAP DRAWN ON TOP OF THE DUNDEE LIMESTONE
DATUM PLANE SEALEVEL
CONTOUR INTERVAL 250 FEET
0 SCALE 4 MILES

FIGURE 7. STRUCTURE MAP ON TOP OF THE DUNDEE LIMESTONE DETERMINED BY SUBTRACTING THE SUNBURY–DUNDEE ISOPACHOUS INTERVAL (FIGURE 9A) FROM THE BEREA STRUCTURE (FIGURE 4)
CONTOUR INTERVAL 250 FEET
0 SCALE 4 MILES

STRUCTURE

Subsurface Structure of the Howell Anticline

A subsurface structural map drawn on top of the Berea sandstone or the base of the Sunbury shale (figure 4) shows an asymmetrical anticline with the trend northwest-southeast and following the northwest-southeast diagonal of the county. It plunges toward the northwest with the steep side toward the southwest and the gentle side toward the northeast. Figure 5A is a map showing the areal geology immediately under the drift of the area studied and figure 5B is one showing the distribution of the formations at sea level. Together they show the tendency of the structure to shift to the northwest with depth. Structural contours drawn on the Dundee limestone, at the contact between the Dundee and Traverse, show a structure similar to that on the Berea, but at much greater depth (figure 6). The similarity of structural features mapped on the Dundee and Berea formations of different age indicates that the structure of the Devonian rocks is reflected upward. The structural contours on the Dundee limestone are modified by the existence of two domes separated by a saddle.

Figure 7 is the inferred structure of the Dundee limestone obtained by subtracting the isopachous interval between the base of the Sunbury and the base of the Traverse from the structural contours on the Berea sand-

FIGURE 8. FIGURE 4 SUPERIMPOSED ON FIGURE 9A

0 SCALE 4 MILES

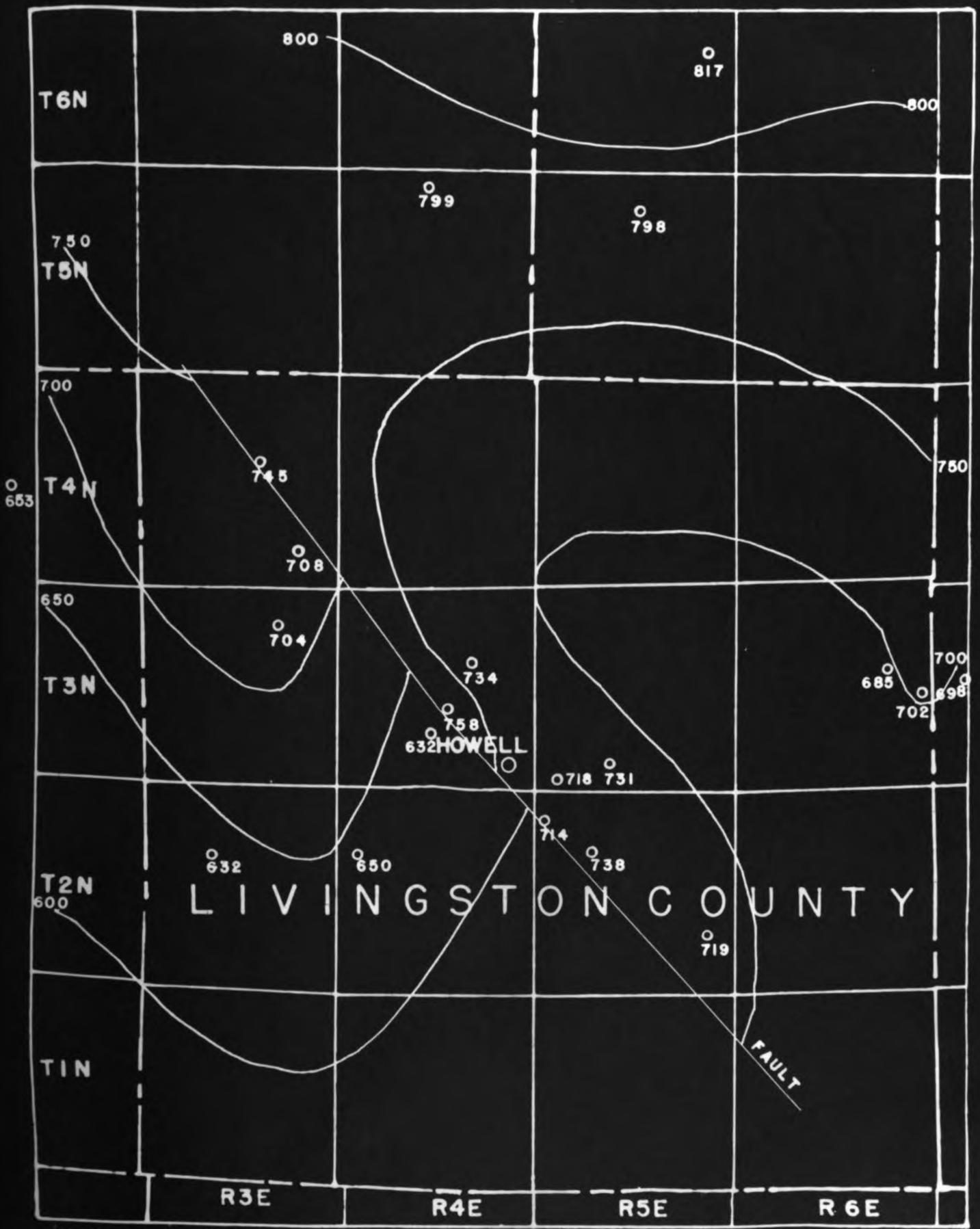


FIGURE 9A ISOPACHOUS MAP SHOWING THE INTERVAL BETWEEN THE BASE OF THE SUNBURY SHALE AND THE TOP OF THE DUNDEE LIMESTONE
ISOPACHOUS INTERVAL 50 FEET
SCALE
0 4 MILES

stone (figure 8). According to the procedure outlined by Lahee (1941, pp. 649-54) control points are obtained for the inferred structural contours wherever an isopachous line crosses a structural line, by subtracting one from the other.

Isopach Studies in Livingston County

Levorsen (1927, pp. 657-82) has shown that the thickness map may also show the structure of the underlying rocks. To make a convergence map two marker horizons are picked which can be easily identified and not confused with other formational horizons. The thickness of all formations between the two horizons is determined and plotted on a map in the proper locations for each control point. Contour lines of equal thickness are then drawn.

The original surface of sediments laid down under water is very nearly flat. If the top marker horizon found at different depths is restored to a flat surface the lower marker horizon is restored to the structure it had at the time the upper stratum was laid down. In this way the isopachous lines show the structure of the rocks underlying the isopachous interval. Thus, if a syncline is the structure of the rocks underlying the lower horizon at the time the upper horizon was laid down the isopachous lines will decrease in thickness outward with the thickest interval at the deepest part of the syncline.

Figure 9A is the isopachous map of the interval

FIGURE 9B. ISOPACHOUS MAP SHOWING THE INTERVAL BETWEEN THE BASE OF THE SUNBURY SHALE AND THE TOP OF THE DUNDEE LIMESTONE CONTOURED WITHOUT A FAULT

ISOPACHOUS INTERVAL 50 FEET

0 SCALE 4 MILES

FIGURE 10. ISOPACHOUS MAP SHOWING THE INTERVAL BETWEEN THE BASE OF THE TRAVERSE FORMATION AND THE TOP OF THE SYLVANIA SANDSTONE
ISOPACHOUS INTERVAL 100 FEET
0 SCALE 4 MILES

between the base of the Sunbury and the base of the Traverse. It shows that the formations thicken to the northeast and thin to the southwest. If a fault is not postulated, as shown in figure 9A, then the isopachous map must be drawn as shown in figure 9B. When this is done a discrepancy occurs at the point X. Here the sediments abruptly thin to 632 feet and then thicken again to 650 feet to the southwest. When a fault is placed as shown and then contoured accordingly this discrepancy disappears.

The area of thin sediments underlain by Dundee limestone in the southwestern part of Livingston County tends to indicate that there may have been a positive area in the Dundee limestone at the beginning of Sunbury time. A map showing the relations between the base of the Traverse and the top of the Sylvania, the Dundee-Detroit River interval (Figure 10), suggests that this positive area was in existence as early as Traverse time.

The inference is that a chute or local basin of deposition existed in the site of the present Howell anticline from Sylvania to Sunbury time. The tendency for all formations deposited between Sylvania and Sunbury times to thicken and thin in the same manner suggests that there was little in the way of diastrophic disturbance in Livingston County during this period.

Theories of the Origin of Folds

There are four theories which may be used to account for the origin of folds. First, the "plains type of folding" advanced by Sidney Powers (1925, pp. 379-92) explains folding in the mid-continent area, by vertical movements; second, tangential pressure causing a shortening of the earth's crust; third, compaction over buried hills, and fourth, vertical movements combined with faulting.

"Plains Type of Folding". The chief characteristics of the "Plains type of folding" are:

1. anticlines, anticlinal noses and domes as the dominant type of structure,
2. progressive folding in which the flexures increase in steepness downward,
3. closures of individual folds which increase with depth,
4. supratenuous folds, in which the formations thin on top of the flexure and thicken on the flanks,
5. absence of true synclines, which are always associated with tangential folding,
6. deep subsurface faulting.

Thinning of the sediments over the folds can be accounted for by progressive folding, differential compaction and regional vertical stresses caused either by local uplift or subsidence.

Folding Caused by Tangential Pressure. Folding of this type is produced by horizontal compressive forces acting tangentially to the surface of the earth. There is an active force from one side, while the other side is passive and acts as a buttress. The result is a buckling and folding of the intervening rocks. This is best illustrated by the Appalachian type of folding (Nevin, 1942, pp. 59-60). This results in the formation of anticlines and synclines which in general parallel each other. This theory is used to account for folding in regions of great orogenic movements.

Compaction over Buried Hills. When a topographic high is submerged below the surface of the sea and covered by sediments a buried hill is formed. The sediments will be thick on the flanks and thin on the top of the hill making a supratenuous fold. This fold is accentuated also by compaction of the sediments. The amount of compaction is larger on the flanks due to the greater amount of sediments.

A buried hill is distinguished from a buried structure which is a fold or anticline truncated by erosion and buried by later sediments. Recurrent uplift tends to arch the beds upwards. In this case the truncated anticline is of greater importance (Ferguson, 1938, pp. 240-44).

Vertical Movements Combined with Faulting. This theory was advanced to account for the formation of individual,

isolated folds in regions where no great orogenic movements occurred (Fath, 1921, pp. 155-64). Deep seated vertical movements in the basement rocks may cause normal faulting by differential uplift or subsidence. The faulting in the competent beds below then brings about folding in the less competent rocks above as the distance increases from the faulting, a fact which has been long recognized.

Origin of the Howell Anticline

The presence of a structural high to the southwest, called the Waterloo structure, has been demonstrated by isopachous maps to exist as early as Middle Devonian time, the axis of which passes through the juncture points of Ingham and Livingston Counties and parallels the present anticlinal trend. The thinning of still earlier sediments in this general direction locally indicates a pre-Devonian existence of this structure.

Asymmetrical anticlines are generally found in areas where compressive forces have caused overturning and overthrusting of folds as in parts of the Rocky Mountains or in the Appalachians. It is thought, that such compressive forces would not produce single folds but many folds separated by synclines. The absence of folds to the northeast and to the southwest and their associated synclines suggests that other causes must be looked for to explain the presence of the Howell anticline. Neither can the "plains type of folding" be employed to

explain this structure. This type of folding requires a long series of short vertical movements over a long period of time. The folding takes place simultaneously with deposition. The formations also thin on the crest and thicken on the flanks. Isopach maps show no folds of the supratenuous type in Livingston County, but rather a thickening in the same general direction from Detroit River to Coldwater time. This indicates that there were no earth movements in the area during this period.

It seems much more likely, in a structure where the sediments are thickest, that faulting probably took place in the basement rocks and lifted the former basin into a structural high. This is supported by the consistency of the structure with depth.

Faulting then would take the form of normal faulting in which the hanging wall has moved down, and the foot wall has moved up. The top of the Dundee limestone, for instance, just to the north of the northwest-southeast county diagonal is over 1000 feet higher on the north side than it is on the south side of the diagonal. This fault has rotated in such a way that the amount of throw would decrease to the northwest and eventually die out in a fold.

It is much more likely that the faulting developed in the basement rocks than in the overlying sedimentary rocks, since the sedimentary rocks would be too incompetent to express a fault upwards for more than 1000 feet.

The faulting started in the basements rocks, faulted the lower sedimentary rocks and died out upward in a fold.

HISTORY OF THE HOWELL ANTICLINE

Throughout the Early and Middle Paleozoic, Livingston County existed as a local basin of deposition. A structural high existed to the southwest. This structure may be the result of a local monadnock in the pre-Cambrian peneplain or in the Cambrian or Ordovician surface. These conditions are shown to have existed by a study of the isopachous maps.

Sediments continued to collect in this basin until the beginning of Coldwater time, as shown by the fact that all formations in general thin in a southwesterly direction up to this time. During Early Coldwater time there was faulting in the basement rocks which raised the basin into a structural high.

The movement may not have taken place all at once, but may have continued over a long period of time. The movement, however, was great enough to prevent the deposition of a great part of the Coldwater formation in the northeastern part of the county. The major part of the faulting must have taken place during Coldwater time because of the manner in which the formation thickens most rapidly to the southwest, much less rapidly to the northeast and generally thins over the crest of the anticline. An examination of well borings along the northwest extension of the structure shows the Coldwater formation to be supratenuous.

At the close of Coldwater time the Howell structure

existed as a barrier in the Marshall seas. This is demonstrated by the absence of the Marshall formation everywhere in Livingston County except in the southwestern part.

The change in lithologic sequence from limestone to shale to sandstone in the interval from Traverse to Berea time is an indication that probably there was a rising highland to the northeast. The Berea sandstone is much coarser and contains much less silt in wells along Lake Huron than it does in Livingston County. Heavy minerals are also found in the Berea in this region. As the distance from the source increased the larger and heavier particles dropped out and only the finer and lighter particles continued to be transported to the west. This rising highland may have been able to receive some measure of relief by normal faulting along an old line of weakness in the basement rocks in Livingston County.

After faulting there was again subsidence and uplift as demonstrated by the Coldwater shale and the return to sand in Marshall time. Thus the faulting may have been recurrent, over a long period of time. Minor quakes have occurred in this area within the memory of living men, thereby indicating that minor movement may have taken place along this fault until the present time (Hobbs, 1911, pp. 69-87).

SUMMARY AND CONCLUSIONS

The stratigraphy of Livingston County ranges in age from Cambrian to Pennsylvanian. Isopach studies show that a local basin of deposition existed in the county until the beginning of Coldwater time. The Howell anticline came into existence at the beginning of Coldwater time as the result of normal rotational faulting in the basement rocks along an old line of weakness resulting from uplift to the northeast. The Howell structure is not a buried hill, nor a folded anticline, but the result of normal faulting expressed upward in the form of an anticline.

BIBLIOGRAPHY

Cohee, George V. — Cambrian and Ordovician wells in Southeastern Michigan; American Association of Petroleum Geologists, Vol. 31, # 2 Feb. 1947, PP 293-307.

Du Bois, E. P. — Subsurface Relations of the Maquoketa and "Trenton" Formations in Illinois; Report of Investigations, # 105, State of Illinois, State Geological Survey, 1945.

Eddy, Gerald E. — A study of the Insoluble Residues of the Lower Traverse, Bell and Upper Dundee Formations of Michigan; Michigan Acad. of Sci. Papers, Vol. 18, PP 345-361; 1933.

Fath, A. E. — Geology of the Eldorado Oil and Gas Field, Butler County, Kansas; Bull. 7, State Geological Survey of Kansas.

Furguson, J. L. and Vernon, J. — The Relationship of Buried Hills to Petroleum Accumulation; Science of Petroleum, Vol. 1, PP 240-244, Oxford University Press, 1938.

Gibbs, Clifford J. — Unpublished manuscript, 1939.

Hobbs, W. H. — Earthquakes in Michigan; Michigan Geol. and Biol. Survey, Pub. 5, Geol. Ser. 3; PP 69-87, 1911.

Keck, William G. — Geophysical Measurements in Livingston County, Michigan; Michigan Acad. of Sci. Papers, Vol. 23, PP 463-476, 1938.

Lahee, Frederic H. — Field Geology, 4th edition, Mc Graw Hill Book Company, 1941.

Lane, Alfred Church — The Geology of Lower Michigan with Reference to Deep Borings (edited from notes of C. E. Wright) Michigan Geol. Survey 5 Pt. 2, 1895.

_____ and Seamen, A. E. — Notes on the Geological Section of Michigan, Annual Report of the State Geologists, Michigan Geol. Survey, 1909.

Levorsen, A. I. — Convergence Studies in the Mid-Continent Region, American Association of Petroleum Geologists, Bulletin, Vol. 11, # 7, pp 657-682, July, 1927.

Nevin, Charles M. — Principles of Structural Geology, 3rd Edition, John Wiley and Sons, Inc., 1942.

Newcombe, R. B. — Oil and Gas Fields of Michigan; a discussion of the depositional and structural features of the Michigan basin; Mich. Geol. Survey Div., Pub. 38, Geol. Ser. 32, c1938.

Powers, Sidney — Structural Geology of the Mid-Continent Region; a Field for Research; Bull. Geol. Soc. Amer., Vol. 36, PP 379-392, 1925; Including an important discussion by K. C. Heald.

Robinson, W. I. — Oil and Gas in Michigan; Mineral Resources of Michigan, Geol. Survey, Pub. 32, Geol. Ser. 26, 1920.

Schuchert, Charles — Stratigraphy of the Eastern and Central U. S. John Wiley and Sons, Inc., 1943.

Smith, R. A. — The Occurence of Oil and Gas in Mich.; Pub. 14, Geol. Ser. 11, Michigan Geological and Biological Survey, 1914.

Ulrich, E. O. — Black Shale Problem in Michigan; Bull. of Geol. Soc. of Amer., Vol. 38, P 231, 1927.

LIVINGSTON COUNTY

	Per. No.	Drift	Sag-inaw	Parma	Bay-Port	Mich.	Up. Marsh	Low. Marsh	Cold-Water	Sun-Bury	Berea Bed-ford	Ant-rim	Tra-verse	Dun-dee	Det. River	Syl-vania	Bass Isle.	Sal-ina	Niag-aran	Cat-aract	Cin-cinn.	Tren-ton	St. Peter
Depth to Top		0								302	317	480	710	1025	1203	1817	2010	2480					
Thickness	41	302								15	163	230	315	178	614	193	470	1160+					
Elev. of Top		890								588	573	410	180	-135	-313	-927	-1120	-1590					
Depth to Top		0							156	273	297	465	691	1031	1305								
Thickness	873	156							117	24	168	226	340	274	27+								
Elev. of Top		896							740	623	599	431	205	-135	-409								
Depth to Top		0							210	280	300	455	672	1038									
Thickness	1010	210							70	20	155	217	366	44+									
Elev. of Top		1004							794	724	708	549	332	-34									
Depth to Top		0							155	436	449	618	846	1081	1359								
Thickness	1020	155							281	13	169	228	235	278	243								
Elev. of Top		957							802	521	508	339	111	-124	-402								
Depth to Top		0							92	123	128	310	553	886	1156	1698							
Thickness	1064	92							31	5	182	243	333	270	542	25+							
Elev. of Top		893							801	770	765	583	340	7	-263	-805							
Depth to Top		0							130	606	625	745	1035	1370									
Thickness	1120	130							476	19	120	290	335	170+									
Elev. of Top		894							764	288	269	149	-141	-476									
Depth to Top		0							166	235	247	435	625	965	1175	1640							
Thickness	1280	166							69	12	188	190	340	120	465	103+							
Elev. of Top		955							789	720	708	520	330	-10	-220	-685							
Depth to Top		0							111	139	151	325	535	865	1070	1555							
Thickness	1308	111							28	12	174	210	330	205	485	145+							
Elev. of Top		922							811	783	771	597	387	57	-148	-633							
Depth to Top		0							330	725	742	930	1090	1444	1610								
Thickness	8783	330							395	17	188	160	354	166	205+								
Elev. of Top		1057							727	332	315	127	- 33	-387	-553								
Depth to Top		0							300	657	695	860	1030	1380	1575								
Thickness	9426	300							357	38	165	170	350	195	193+								
Elev. of Top		989							689	332	294	129	-41	-391	-586								
Depth to Top		0			140	170	358	455	1405	1430	1590	1795	2080	2248									
Thickness	9568	140			30	188	97	950	25	160	205	285	168	38+									
Elev. of Top		941			801	771	583	486	-464	-489	-649	-854	-1139	-1307									
Depth to Top		0						205	345	355	537	737	1086										
Thickness	9782	205						140	10	182	200	349	44+										
Elev. of Top		980						775	635	625	443	243	-106										

TABLE 1.

Tabulated table of data showing depth to top, thickness, and elevation of the top of each formation penetrated in wells used in the study.

LIVINGSTON COUNTY

	Per. No.	Drift	Sag-inaw	Parma	Bay-Port	Mich.	Up. Marsh	Low. Marsh	Cold-Water	Su	n-bury	Berea Bed-ford	Ant-rim	Tra-verse	Dun-dee	Det. River	Syl-vania	Bass Isle.	Sal-ina	Niag-aran	Cat-aract	Cin-cinn.	Tren-ton	St. Peter
Depth to Top		0				81	105	233	312	12	87	1302	1450	1681	1947									
Thickness	10038	81				24	128	79	975		15	148	231	266	149+									
Elev. of Top		928				847	823	695	616	-3	59	-374	-522	-753	-1019									
Depth to Top		0				105	178	258	393	13	43	1356	1515	1735	2060	2230	2575	2747	3160	4650				
Thickness	10990	105				73	80	135	950		13	159	220	325	170	345	172	413	1490	196+				
Elev. of Top		920				815	742	662	527	-4	23	-436	-595	-815	-1140	-1310	-1655	-1827	-2240	-3730				
Depth to Top		0							165	2	23	235	430	618	954	1141	1507	1865	2385	4037				
Thickness	11818	165							58		12	195	188	336	187	366	358	520	1652	177				
Elev. of Top		968							803	7	45	733	538	350	14	-173	-539	-897	-1417	-3069				
Depth to Top		0										110	285	504	838	937	1650	1817	2331	3970	4299	4575	4983	5885
Thickness	2179	110										175	219	334	99	713	167	514	1639	329	276	408	902	73+
Elev. of Top		914										804	629	410	76	-23	-914	-903	-1417	-3056	-3385	-3661	-4069	-4971

GENESEE COUNTY

Depth to Top		0	193						335	12	20	1236	1430	1628	2034									
Thickness	2828	193	142						885		16	194	198	406	136+									
Elev. of Top		833	640						498	-3	87	-403	-597	-795	-1201									
Depth to Top		0				180	250		375	13	50	1383	1592	1794	2200									
Thickness	7275	180				70	125		975		33	209	202	406	293									
Elev. of Top		797				727	547		422	-5	53	-586	-795	-997	-1403									

INGHAM COUNTY

Depth to Top		0	110	421	533	573	760	815	1161	1930		1940	2067	2313	2593									
Thickness	792	110	311	112	40	187	55	346	769	10		127	246	280	33+									
Elev. of Top		915	805	494	382	342	155	100	-246	-1015		-1025	-1152	-1398	-1678									

OAKLAND COUNTY

Depth to Top		0							286	765		785	990	1140	1483									
Thickness	9262	286							479	20		205	150	343	117+									
Elev. of Top		1040							754	275		255	50	-100	-443									

SHIAWASSEE COUNTY

Depth to Top		0	126						243	1129		1145	1330	1550	1944									
Thickness	8968	126	117						886	16		185	220	394	237+									
Elev. of Top		827	710						584	-302		-318	-503	-723	-1117									

Table 1 continued

APPENDIX

The well logs which follow and upon which the report is based were originally prepared by members of the Michigan Geological Survey. In some, stratigraphic divisions will be found which it was not thought necessary to incorporate into the report. Any changes which it was thought necessary to make in the logs have been indicated in parenthesis.

Conway Twp. (Livingston County)

Norris-Smith-Hoover, et al

Ross Robb #1 Permit # 41

Contractor: Jack L. Hoover

Location: SE¼ of SE¼ of SE¼ of section 26, T. 4N., R. 3E. 300 feet from east and 300 feet from south line of quarter section

Elevation: Approximately 890 feet above sea level.

Record by: R. B. Newcombe from driller's log and samples.

	Thickness (Feet)	Depth (Feet)
No record	302	302
MISSISSIPPIAN:		
Sunbury:		
Dense black shale with pyrite	10	312
Black shale with pyrite and sandstone streaks	5	317
Berea:		
Fine grained pyritiferous gray sandstone (some gray shale) salt water at bottom with first sand-streak	7	324
Gray sandstone (fine grained with black specks, pyrite mica and gray shale) drills coarse	10	334
Gray micaceous sandstone with pyrite (drills very fine)	2	336
Brownish gray micaceous sandstone with some gray shale	5	341
Sandstone (no samples)	76	417
Bedford: (?)		
Blue gray shale	63	480
DEVONIAN:		
Antrim:		
Black to brownish pyritiferous shale (epidote observed) scattered samples	160	640
Greenish gray shale (somewhat calcareous)	20	660
Brown to black pyritiferous shale with calcareous streaks	30	690
Brownish black pyritiferous shale and gray buff limestone	10	700
Dark brownish gray shale (pyrite)	10	710

Page 2 - Conway Twp. (Livingston County)
Norris-Smith-Hoover, et al - Ross Robb #1

	Thickness (Feet)	Depth (Feet)
Traverse:		
Buff limestone, pyrite, and dark gray shale	4	714
Sandy pyritiferous brown limestone (salt wtr at 715)	7	721
Gray to buff limestone (evidence of gypsum)	5	726
Gray shale with gypsum	3	729
Gray shale	21	750
Gray cherty and dolomitic limestone	30	780
Light gray dolomitic limestone (no sample)	5	785
Dolomite (fresh water at 790)	5	790
Oily dolomite	10	800
Porous light buff iron stained dolomitic limestone (white and cherty in lower part)	45	845
Light (very) buff cherty limestone	10	855
Gray shale and buff limestone	5	860
Light buff limestone	5	865
Light gray to light buff limestone (fossiliforous and drills fine)	30	895
Gray fossiliforous limestone (drills coarser)	40	935
Soft gray calcareous shale	25	960
Gray fossiliferous limestone	15	975
Gray shale	5	980
Gray to buff fossiliforous limestone with pyrite	10	990
Bell:		
Gray shale (calcareous)	35	1025
Dundee:		
Gray fossiliforeous limestone	25	1050
Buff dolomitic limestone	65	1115
Brownish buff oily dolomite	20	1135
Gray to buff oily dolomitic limestone	10	1145
Buff oily dolomite (snow-white limegypsum ? at 1150)(nice show of oil and small amount of wtr at 1155)	10	1155
Light gray to buff dolomite and dolomitic limestone	35	1190
Buff dolomitic limestone (drills up into very fine grains resembling sand) black water and fairly good showing of oil at bottom	13	1203

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Norris-Smith-Hoover, et al - Ross Robb #1

	Thickness (Feet)	Depth (Feet)
Detroit River:		
Very fine grained light buff dolomite (drills to powder)	17	1220
Buff crystalline oily dolomite	15	1235
Lighter buff dolomite (iron stained)	30	1265
Brown oily dolomite and anhydrite	25	1290
White to brown dolomite and anhydrite	5	1295
Buff granular dolomite showing pyrite, limonite and anhydrite	10	1305
Brown to buff porous granular oily dolomite	20	1325
Buff to bluish gray anhydrite and dolomite	30	1355
No record	19	1374
Brownish iron stained sandy dolomite (glass in samples probably put in hole in drill with Sylvania?)	16	1390
White to gray gypsum and anhydrite	5	1395
Buff sandy dolomite	15	1410
White anhydrite and buff dolomite	5	1415
Light gray to buff dolomite	25	1440
Buff dolomite and white anhydrite	5	1445
White anhydrite	5	1450
Buff dolomite and bluish white anhydrite	5	1455
Blue gray to buff dolomite	5	1460
Granular oily buff dolomite	20	1480
White anhydrite and buff dolomite	15	1495
Brownish buff granular, oily dolomite drills fine	15	1510
Light buff dolomite	10	1520
Gray to buff dolomite and white anhydrite	15	1535
Light buff dolomite	20	1555
Gray dolomite and anhydrite	5	1560
Fine grained buff oily dolomite	5	1565
Buff dolomite and anhydrite	15	1580
Light buff dolomite	10	1590
Buff porous granular dolomite	5	1595
Buff dolomite and gypsum	20	1615
Light buff dolomite	25	1640
Brownish buff dolomite	10	1650
Buff dolomite and anhydrite	10	1660
Iron stained and buff dolomite (some anhydrite)	15	1675
Brownish buff dolomite	5	1680
Varnish buff dolomite	55	1735
Dark brownish oily dolomite	20	1755

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Norris-Smith-Hoover, et al - Ross Robb #1

	Thickness (Feet)	Depth (Feet)
Light brownish buff crystalline dolomite (drills fine)	20	1775
Brownish buff dolomite (iron stained and drills coarser)	20	1795
Brownish buff oily dolomite	5	1800
Granular grayish buff dolomite (iron stained)	17	1817
Sylvania:		
White to grayish buff sandy dolomite	13	1830
Light yellowish dolomitic cemented sandstone (individual grains white)	15	1845
White sandstone (iron stained and coarser grained) Many greenish and pink grains, Smoky quartz	10	1855
Highly iron stained yellowish sandstone	5	1860
Gray dolomitic sandstone (iron stained)	20	1880
White sandstone with gray dolomitic cement (iron stained) coarse from 1885-1890	25	1905
Fine grained white sandstone (iron stained)	35	1940
White iron stained sandstone (grains faceted and coarser)	5	1945
Gray sandstone with dolomitic cement (iron stained)	15	1960
Yellowish gray sandstone	25	1985
White cherty dolomite	15	2000
White cherty dolomite (iron stained)	10	2010
Bass Island:		
White to brownish buff dolomite	25	2035
Granular buff dolomite	15	2050
Light grayish buff dolomite (cherty and iron stained)	5	2055
Buff dolomite	10	2065
Blue gray to buff dolomite	10	2075
Blue gray dolomite	15	2090
Buff dolomite	15	2105
Blue gray to buff dolomite	15	2120
Buff dolomite	10	2130
Gray to buff dolomite	35	2165
Buff dolomite (iron stained)	62	2227
Buff dolomite (drills very fine)	14	2241
Buff dolomite (iron stained)	3	2244
Buff dolomite (drills fine)	6	2250
Blue gray to buff dolomite (iron stained)	2	2252
Buff sand dolomite (drills fine and packs into cemented mass)	5	2257
Gray to buff iron-stained dolomite	6	2263

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Norris-Smith-Hoover, et al - Ross Robb #1

	Thickness (Feet)	Depth (Feet)
Buff argillaceous dolomite	5	2268
Buff dolomite (iron stained)	3	2271
Light buff argillaceous dolomite	5	2276
Gray to buff flinty dolomite (iron stained	4	2280
Light buff argillaceous dolomite	11	2291
Blue gray to buff dolomite (iron stained)	17	2308
Light gray argillaceous dolomite	4	2312
Gray to buff dolomite (iron stained)	11	2323
Light gray argillaceous dolomite	4	2327
Gray to buff dolomite	7	2334
Light gray argillaceous dolomite (drills very fine)	6	2340
Gray sandy dolomite	21	2361
Light gray dolomite	9	2370
Buff sandy dolomite	19	2389
Buff sandy dolomite (red shale reported in driller's log)	4	2393
Shaly gray dolomite (some buff colored beds) This may be near the top of the Salina although salt beds do not appear until 2480	18	2411
Buff dolomite	5	2416
Gray shale, iron stained in part	14	2430
Pink and gray shale (driller logged red shale 2420-80)	19	2449
Gray and pink shale	31	2480
Salina:		
Gray shale and some salt	33	2483
Salt	5	2488
Gray shale	5	2493
White to buff colored salt (gypsum near the bottom)	50	2543
Gray shale and pink gypsum	29	2572
Buff salt	16	2588
Dirty salt	25	2613
Gray shale	13	2626
Clear white salt	36	2662
Dirty salt	26	2688
Gray shale	5	2693
Salt with some shale (probably cavings)	45	2738
Gray shale	11	2749
Light gray gypsifferous shale	10	2759
Brownish buff dolomite	4	2763
Gray shale	9	2772
Brownish dirty salt	15	2787
Shaly salt	24	2811
Clear salt	22	2833
Brownish buff dolomite	17	2850
Gray shale	5	2855

Page 6 - Conway Twp. (Livingston County)
Norris-Smith-Hoover, et al - Ross Robb #1

	Thickness (Feet)	Depth (Feet)
Dirty salt	13	2868
Dolomite	7	2875
Dirty salt	6	2881
Clear salt	12	2893
Dirty salt	5	2898
Gray calcareous shale	6	2904
White to buff salt (variegated pink and white vein salt at the bottom)	62	2966
Gray dolomite and anhydrite	10	2976
Gray to buff dolomite that drills more or less flakey (thin bedded). Sandy and porous in part	107	3083
Salt, shaly	9	3104
Dirty buff salt	17	3121
Red, blue, and greenish shale with some gypsum	34	3155
Gray shale - dolomitic near the bottom	55	3210
Salt	5	3215
Brownish gray shaly dolomite	10	3225
Salt	5	3230
Gray shale	6	3236
White and buff salt (somewhat shaly)	40	3276
Salt and limestone	8	3284
Salt (some clean and some dirty)	39	3323
Dolomite	7	3330
Salt (somewhat dirty) white to buff	186	3516
Gray dolomitic limestone	4	3520
Dark gray bituminous limestone	12	3532
Gray bituminous limestone	36	3568
Buff limestone (drills up very fine) (wtr at 3573)	6	3574
Gray limestone	19	3593
Light gray limestone	5	3598
Gray limestone	3	3601
Shale (dark gray limey)	11	3612
Gray limestone (some light gray streaks)	17	3629
Somewhat light gray limestone (iron stained and with buff shale)	11	3640

Casing record:
10" 94'
8-1/4" 440'
6-5/8" 1374'
5-3/16" 2389'

Drilled in 1928
Plugged and abandoned: 11-30-28
Caving made plugging necessary

Howell Twp. (Livingston County)

P. A. Meyers, et al
Crandall #1 Permit #873
Drilling Contractor: Crude Oil Company

Location: SW¼ of NW¼ of NW¼ of section 14, T.3N., R.4E. 1120' from north and 200 feet from west line of quarter section

Elevation: 896 feet above sea level

Record by: O. F. Poindexter from driller's log and samples:

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Soil	4	4
Gravel	8	12
Clay	18	30
Sand and gravel (water)	10	40
Clay	10	50
Sand and gravel (water)	10	60
Clay	15	75
Sand and gravel (water)	7	82
Clay	13	95
Hard pan	5	100
Clay (little gas 115-120; water)	56	156
MISSISSIPPIAN:		
Coldwater:		
Sandy shale	73	229
Gray micaceous sandstone and gray sandy shale	17	246
Sandy shale (no samples)	27	273
Sunbury:		
Dark brown shale	10	283
Sandy shale	2	285
Brown shale	5	290
Brown shale and sandy shale	7	297
Berea:		
Light brown micaceous sandstone with some gray sandstone cavings	24	321
Light brown micaceous sandstone with gray shale and gray sandstone (show oil 325)	13	334
Light brown micaceous sandstone with a little gray sandstone	28	362
Gray micaceous sandstone with a little light brown micaceous sandstone	42	404
Fine grained gray micaceous sandstone and gray sandy shale	18	422
Gray sandy shale, fine grained gray sandstone and thin beds of sandy gray limestone	27	449

Page 2 - Howell Twp. (Livingston County)
P. A. Meyers, et al - Crandall # 1

	Thickness (Feet)	Depth (Feet)
Gray shale with gray sandstone (cavings ?)	16	465
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Dark brown to black shale - pyritiferous	141	606
Brown shale with some light greenish gray shale	44	650
Black pyritiferous shale	17	667
Black pyritiferous shale and brown dolomite (concretions)	24	691
DEVONIAN:		
Traverse:		
Gray limy shale with brown dolomite cavings	27	718
Gray shale and gray cherty limestone	21	739
Gray cherty limestone	14	753
Gray and buff cherty limestone	8	761
Buff limestone with shale and chert cavings (water 755-790)	31	792
Gray and buff gray limestone	41	833
Buff and gray limestone with black shale cavings	14	847
Gray buff and brown limestone	9	856
Gray limestone	121	977
Bell:		
Gray limestone and gray shale	32	1009
No samples	22	1031
Dundee:		
Gray buff limestone (rainbow oil 1047; little water 1052)	5	1036
Buff limestone	68	1104
Light buff limestone	10	1114
Light buff and light brown limestone	9	1123
Buff sandy limestone (show oil & gas 1130-36)	13	1136
Buff gray and buff sandy limestone	7	1143
Fine buff crystalline limestone	12	1155
Light grayish buff sandy limestone	32	1187
Grayish buff sandy limestone	13	1200
Light yellowish buff porous crystalline limestone (water 1215)	33	1233
Fine light buff crystalline limestone	9	1242
Light buff porous crystalline limestone	9	1251
Light brown buff limestone	8	1259
Light brown buff limestone	7	1266
Grayish buff cherty limestone	29	1295

Page 3 - Howell Twp. (Livingston County)
P. A. Meyers, et al - Crandall #1

	Thickness (Feet)	Depth (Feet)
Light brown buff cherty porous crystalline limestone	10	1305
Detroit River:		
Gray and brownish buff cherty dolomite	10	1315
Buff dolomite and anhydrite	17	1332

Casing record:
10" 122'
8¼" 630'
6-5/8" 1021'

Commenced: 12-30-29
Completed: 1-30-30
Initial Production: Dry hole
Plugged and abandoned: 2-5-30

Genoa Twp., (Livingston County)

A. S. Storm

Latson #1 Permit #1010

Location: W½ SE¼ section 8, T. 2N., R. 5E. 1000' from north and 350' from west line of quarter section

Elevation: 1004 feet above sea level.

Record by; O. F. Poindexter from driller's log and samples.

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Surface	3	3
Clay	22	25
Sand, fine	11	36
Sand (water)	9	45
Sand and gravel - samples	55	100
Clay and sand	10	110
Sand and gravel	23	133
Clay and gravel	15	148
Sand - show oil	2	150
Clay	8	158
Sand - show oil	42	190
No record (water)	10	200
Sand, gravel with limestone and chert fragments (water) samples	10	210
MISSISSIPPIAN:		
Coldwater:		
Sandstone, gray - samples	15	225
Shale, green - no samples	49	274
Shale, gray - no samples	6	280
Sunbury:		
Shale, black - no samples	4	284
Shale, black with a little gray sandstone - samples	16	300
Berea: (Top 296)		
Sandstone - show oil 300-310, no samples	16	316
Shale, sandy, limestone - no samples	14	330
Sandstone, brown - samples	13	343
Shale, black - no samples	17	360
Shale, black and limestone - no samples	12	372
Sandy limestone - no samples	23	395
Shale, gray - no samples	20	415
Sandstone, brown and gray - samples	20	435
Sandstone, gray and brown micaceous and gray shale - samples	20	455

Page 2 - Genoa Twp., (Livingston County)
A. S. Storm
Latson #1

	Thickness (Feet)	Depth (Feet)
DEVONIAN:		
Antrim:		
Shale, black - no samples	45	500
Shale, dark brown to black	120	620
Shale, black and greenish gray shale	8	628
Dolomite, hard gray sandy	2	630
Shale, purplish brown to gray	10	640
Shale, dark brown to black	10	650
Shale, brown to black and brown dolomite	10	660
Shale, brown and brown dolomite - show oil	12	672
Traverse (Top 670):		
Shale, gray and dolomite	8	700
Limestone, gray shaly	20	720
Limestone, gray	35	755
Limestone, gray and buff to brown	5	760
Limestone, white to buff and brown, slightly cherty	5	765
Limestone, gray and brown slightly cherty	10	775
Limestone, brown dolomitic cherty	10	785
Limestone, brownish gray cherty	32	817
Limestone, grayish to brownish buff cherty, drills coarse	5	822
Limestone, gray shaly	5	827
Limestone, grayish buff to brown cherty	16	843
Limestone, buff to grayish brown slightly cherty	4	847
Limestone, gray shaly	61	908
Shale, gray	28	936
Limestone, gray	6	942
Shale, gray	13	955
Limestone, gray	21	976
Bell:		
Shale, gray	27	1003
Shale, gray and gray fossiliferous limestone	21	1024
Limestone, gray	14	1038
Dundee:		
Limestone, gray and buff	5	1043
Limestone, yellowish buff	16	1059
Limestone, buff - oil 1053-1080	19	1078
Limestone, buff - with much calcite	3	1081
Limestone, buff, sandy, with much calcite water	1	1082

Casing record:
10" 225'
6-5/8" 1053'

Commenced: 6-30-30
Completed: 9-1-30
Initial Production: Dry hole
Shot: 9-11-30 from 1074-1070 with 50 qts.

Howell Twp. (Livingston County)

Crude Oil Co. of Mich.
J. Tooley #1 Permit #1020
Drilling Contractor: Crude Oil Company

Location: SE¼ of SE¼ of NE¼ of section 28, T.3N., R.4E. 320 feet from south and 320 feet from east line of quarter section

Elevation: 957 feet above sea level

Record by: O. F. Poindexter from driller's log and samples

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Drift - no samples	151	151
Sand and gravel	4	155
MISSISSIPPIAN:		
Coldwater:		
Gray sandy shale with drift cavings	47	202
Gray sandy and micaceous shale, a few drift cavings	55	257
Gray shale and gray sandy shale	35	292
Gray sandy shale	99	391
Gray sandy shale and gray shale	45	436
Sunbury:		
Black shale with a little greenish gray shale and gray shale cavings	13	449
Berea:		
Fine grained brown micaceous sandstone with black shale, cavings	7	456
Fine grained brown and gray micaceous sandstone with black shale cavings (small show oil 469-483)	59	515
Fine gray and brown micaceous sandstone	40	555
Fine grained gray micaceous sandstone and gray shale	63	618
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Dark brown to black shale	110	728
Greenish gray and brown shale - some cavings	39	767
Greenish gray and brown shale	33	800
Dark brown to black pyritiferous shale with some gray shale and brown dolomite	35	835
Brown magnosian limestone (concretions(?)	11	846
DEVONIAN:		
Traverse:		
Gray limy shale with a little brown magnesian limestone (cavings)	13	859

Page 2 - Howell Twp. (Livingston County)
Crude Oil Co. of Michigan - J. Tooley #1

	Thickness (Feet)	Depth (Feet)
Gray shaly and cherty limestone	18	877
Gray and buff gray cherty limestone	20	897
Gray, buff and brown cherty limestone	28	925
Gray and brown fossiliferous limestone (cave at 957)	32	957
Gray fossiliferous shaly limestone	19	976
Gray shaly limestone with cavings	5	981
Gray shale	11	992
Gray shaly limestone and limy shale	51	1043
Bell:		
Gray limy shale and gray fossiliferous limestone	38	1081
Dundee:		
Buff limestone with gray limy shale and gray shaly limestone	12	1093
Buff limestone with gray shale and limestone cavings	12	1105
Buff limestone (small show oil 1130)	62	1167
Buff and light gray buff limestone	26	1193
Light gray buff to buff limestone	37	1230
Light buff limestone	18	1148
Buff and brown magnesian limestone	13	1261
Buff crystalline magnesian limestone	16	1277
Brownish buff crystalline magnesian limestone	6	1283
Buff magnesian limestone	25	1308
Brownish buff magnesian limestone	13	1321
Buff and brown magnesian limestone	18	1339
Buff magnesian limestone	20	1359
Detroit River:		
Buff and gray limy dolomite	32	1391
Buff and gray limy dolomite with a little anhydrite	11	1402
Buff and brown dolomite	16	1418
Light gray and buff dolomite	40	1458
Buff and gray dolomite	6	1464
Light buff dolomite	5	1469
Brown and dark brown dolomite	12	1481
Brown dolomite	7	1488
Light buff to brown dolomite with a little anhydrite	19	1507
Brown dolomite with a little anhydrite	12	1519
Light brown dolomite	5	1524
Light brown dolomite with a little anhydrite	7	1531
Light brown and gray dolomite	14	1545
Light yellow buff dolomite	13	1558
Light buff dolomite	7	1565
Buff to brown dolomite	12	1577

Page 3 - Howell Twp. (Livingston County)
Crude Oil Co. of Michigan - J. Tooley #1

	Thickness (Feet)	Depth (Feet)
Buff dolomite with fine angular clear sand grains (Sylvania?)	16	1593
Buff dolomite	9	1602

Casing record:
14" 151'
10" 358'
8¼" 976'

Commenced: 7-8-30
Completed: 8-5-30
Initial Production: Dry hole
Plugged and abandoned: 8-10-30

Howell Twp. (Livingston County)

Crude Oil Co., & Empire Oil and Refining Co.
G. A. Wilkinson #1 Permit #1064

Location: NE¼ of NE¼ of SW¼ of section 22, T.3N.,R.4E. 250 feet from north and 330 feet from east line of quarter section

Elevation: 893 feet above sea level

Record by: O. F. Poindexter from driller's log and samples

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Drift	92	92
MISSISSIPPIAN:		
Coldwater:		
Sandstone, fine grained, gray, silty, micaceous, a little gray shale, dolomite and chert	16	108
Sandstone, fine grained, gray, silty, micaceous, gray shale and greenish gray glauconitic (?) dolomite	15	123
Sunbury:		
Shale, black, pyritiforous, sandstone and dolomite cavings	5	128
Berea:		
Sandstone, gray and brown, pyritiferous, cherty, gray black shale and drift cavings	3	131
Sandstone, gray and brown fine grained, micaceous, pyritiferous, cherty, drift cavings	10	141
Sandstone, brown, fine grained, micaceous, pyritiferous	28	169
No sample	3	172
Sandstone, brown and gray, fine grained, micaceous, pyritiferous, shale, gray	17	189
Sandstone, gray and brown, fine micaceous, pyritiferous	15	204
Sandstone, brown and gray, fine grained, micaceous, pyritiferous	35	239
Sandstone, gray and brown, fine grained, micaceous, pyritiferous, a little brown dolomite	12	251
Sandstone, gray, fine grained shale, gray, micaceous	59	310

Page 2 - Howell Twp. (Livingston County)
Crude Oil Co. & Empire Oil & Refining Co. -
C. A. Wilkinson #1

	Thickness (Feet)	Depth (Feet)
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, dark brown to black with gray shale and sandstone cavings	88	398
Shale, dark brown to black	49	447
Dolomite, gray shale, shale-gray, dark gray and black pyritiferous	8	455
Shale, black	7	462
Dolomite, gray, shaly; shale, gray, dark gray to black, pyritiferous	26	488
Shale, black, pyritiferous; some gray shale	22	510
Shale, brown to black, pyritiferous dolomite, brown	12	522
Dolomite, brown	16	538
No sample	9	547
Dolomite, brown	6	553
DEVONIAN:		
Traverse:		
Shale, gray	6	559
Limestone, gray, dolomite, cherty; shale, gray	30	589
Limestone, gray and brownish (6-7 bbls wtr per hr 600-605)	13	602
Limestone, gray, brownish, white and buff cherty	6	608
Limestone, buff, white and gray, cherty	13	621
Limestone, buff, cherty	10	631
Limestone, brownish gray and buff cherty	6	637
Limestone, brownish gray, slightly cherty	24	661
Limestone, light buff, cherty	6	667
Limestone, light buff and gray, cherty	13	680
Limestone, grayish brown, granular	7	687
Limestone, gray and grayish brown, variegated	12	699
Limestone, gray, variegated, fossiliferous pyritiferous; a little gray shale	7	706
Limestone, gray, argillaceous, fossiliferous	47	753
Bell:		
Shale, gray, limy; limestone, gray	13	766
Shale, gray, limy	6	772

Page 3 - Howell Twp. (Livingston County)
Crude Oil Co. & Empire Oil & Refining Co. -
C. A. Wilkinson #1

	Thickness (Feet)	Depth (Feet)
Shale, gray, limy; limestone, gray argillaceous, fossiliferous	8	780
Limestone, gray, shaly, fossiliferous; shale, gray, limy	44	824
Shale, gray, limy; limestone, gray, shaly, fossiliferous	43	867
Shale, gray, limy; limestone, gray and brownish buff, variegated	19	886
Dundee:		
Limestone, brownish buff with gray limestone and shale cavings	20	906
Limestone, brownish buff (small oil show 925-30)	19	925
Limestone, light brown	25	950
Limestone, buff	20	970
Limestone, buff to brown	7	977
Limestone, buff to brown, considerable white calcite (small show oil 990-96)	25	1002
Limestone, brown, buff and light gray (small show oil 1005-1008)	11	1013
Limestone, brownish buff	7	1020
Limestone, buff to brownish buff; fluorite (?)	21	1041
Limestone, brown, crystalline	6	1047
Limestone, brown and light gray	7	1054
Limestone, light brown and light gray	5	1059
Limestone, buff	5	1064
Limestone, light brown (black water 1075)	9	1073
Limestone, buff	7	1080
Limestone, light buff and light gray	14	1094
Limestone, light buff, dolomite	13	1107
Limestone, brown dolomitic, cherty	8	1115
Limestone, light brown, dolomitic, cherty	35	1150
Limestone, buff, dolomitic, cherty	6	1156
Detroit River:		
Dolomite, buff; anhydrite	7	1163
Dolomite, buff	6	1169
No samples	14	1183
Dolomite, buff, brown and brownish gray; anhydrite	27	1210
Dolomite, buff to brown	19	1229
Dolomite, yellowish buff and gray; anhydrite	27	1268
Dolomite, gray and buff; anhydrite	8	1276
Dolomite, yellow buff and gray; anhydrite	10	1286
Dolomite, brown to dark brown	8	1294

Page 4 - Howell Twp. (Livingston County)
Crude Oil Co. & Empire Oil & Refining Co. -
C. A. Wilkinson #1

	Thickness (Feet)	Depth (Feet)
Dolomite, brown, limy	10	1304
Dolomite, brown to brown, anhydrite	12	1316
Dolomite, brownish buff; anhydrite	13	1329
Dolomite, brownish buff	14	1343
Dolomite, brownish buff; anhydrite	10	1353
Anhydrite and dolomite, brownish buff	23	1376
Dolomite, brownish buff to brown	13	1389
Dolomite, brownish buff; anhydrite	9	1398
Dolomite, brownish buff; a little anhydrite	22	1420
Dolomite, tan white; anhydrite (no samples) to 1575(slight show oil 1425-30)	5	1425
Dolomite, light buff	7	1432
Dolomite, light buff; anhydrite	15	1447
Limestone, dolomite, gray white	10	1457
Dolomite, white and light gray; anhydrite	8	1465
Dolomite, white and tan white	18	1483
Dolomite, light gray	7	1490
Dolomite, light tan; anhydrite	12	1502
Dolomite, light tan and buff; anhydrite	5	1507
Dolomite, light buff	10	1517
Dolomite, buff (slight show oil 1520)	6	1523
Dolomite, tan white, siliceous	12	1535
Dolomite, white; little anhydrite	8	1543
Dolomite, white, siliceous	7	1550
Dolomite, light buff, siliceous	5	1555
Dolomite, gray buff, sandy; anhydrite	7	1562
Dolomite, gray buff, siliceous; little anhydrite	8	1570
Dolomite, buff sandy	5	1575
Dolomite, brownish buff to brown and gray	5	1580
Dolomite, gray and brownish buff	13	1593
Dolomite, buff and gray	9	1602
Limestone and dolomite, brown, black and buff, sandy	7	1609
Limestone, brown and black, dolomitic, very sandy (about 50% sand)(slight show oil 1610)(Sylvania?)	5	1614
Limestone, light brown, dolomitic, sandy	5	1619
Dolomite, brown, limy	5	1624
Dolomite, light brown, limy, slightly cherty	3	1627
Dolomite, grayish brown	5	1632
Dolomite, brown	10	1642
Dolomite, grayish brown, limy	7	1649
Dolomite, brown, limy	4	1653

Page 5 - Howell Twp. (Livingston County)
Crude Oil Co. & Empire Oil & Refining Co. -
C. A. Wilkinson # 1

	Thickness (Feet)	Depth (Feet)
Dolomite, grayish brown, limy	4	1657
Dolomite, brown, limy	11	1668
No sample	6	1674
Dolomite, grayish brown, limy	5	1679
Dolomite, brown, limy	6	1685
Dolomite, grayish brown, limy	6	1691
Dolomite, brown, limy	7	1698
Sylvania:		
Dolomite, gray buff, cherty (1300' wtr 1695-1710)	7	1705
Dolomite, buff gray cherty	6	1711
Dolomite, gray buff and buff gray crystalline, cherty	12	1723

Casing record:
14" 98'
10" 130'
8¼" 547'
6-5/8" 754'
5-3/16" 1614'

Commenced: 9-11-30
Completed: 10-31-30
Initial Production: Dry hole
Plugged and abandoned: 11-31-30

Conway Twp. (Livingston County)

Kehlet & Craft

Killinger #1 Permit # 1120

Location: NW¼ of NE¼ of section 15, T. 4N., R. 3E. 300 feet from north and 300 feet from west line of quarter section

Elevation: 894 feet above sea level

Record by: O. F. Poindexter from driller's log and samples

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
No record	5	5
Quicksand	85	90
Blue shale	20	110
Quicksand	10	120
Sand - water	10	130
MISSISSIPPIAN:		
Coldwater:		
Blue shale (gas)	45	175
Shale, (gas)	5	180
Shale	100	280
Shale, light gray	85	365
Shale, sandy (gas at 375?)	241	606
Sunbury:		
Shale	9	615
Shale, dark brown, pyritiferous	10	625
Sunbury and Berea:		
Shale, dark brown, pyritiferous, light brown micaceous sandstone	5	630
Berea:		
Sandstone, gray, micaceous; little gray, sandy micaceous shale (oil 630-640)	25	655
Shale, gray; sandstone, gray, micaceous	18	673
Sandstone, gray micaceous; shale, gray	4	677
Sandstone, gray, micaceous (oil 682-687)	22	699
Sandstone, gray, micaceous; shale, gray	23	722
Sandstone, gray, micaceous; little gray shale	4	726
Shale, gray; sandstone, gray	19	745
DEVONIAN:		
Antrim:		
Shale, black	25	770
Shale, no samples	250	1020

Page 2 - Conway Twp. (Livingston County)
Kehlet & Craft - Killinger #1

	Thickness (Feet)	Depth (Feet)
Shale, brown; dolomite, brownish gray; pyritiferous	5	1025
Dolomite, brown (concretions?)	5	1030
No sample	5	1035
Traverse:		
Shale, gray	15	1050
Dolomite, gray, limy, cherty; little gray shale	10	1060
Limestone, buff gray, cherty	5	1065
Limestone, gray, cherty	5	1070
Limestone, gray	5	1075
No sample	10	1085
Limestone, gray, fossiliferous (show gas 1090)	7	1092
Limestone, gray, buff and brown	5	1097
Limestone, white to light buff (HFW 1105)	16	1113
No sample	6	1119
Limestone, white to buff, cherty	12	1131
Limestone, white to buff, brown and gray	3	1134
Limestone, brownish gray, buff and brown (gas and oil 1146-1152; HFW 1146)	18	1152
Limestone, grayish brown	8	1160
No sample	10	1170
Limestone, gray, brown and buff, cherty	5	1175
No record	194	1369
Limestone, brown to dark brown, variegated	1	1370
Dundee:		
Limestone, buff to brown, little dark brown limestone and gray shale cavings	11	1381
No sample	10	1391
Limestone, buff to brown	18	1409
Limestone, buff to brownish buff	26	1435
Limestone, buff and brown, variegated, flaky (gas 1440-1450)(water 1465)	17	1452
Limestone, buff and brown	6	1458
Limestone, light to dark brown	2	1460
Limestone, gray and brown	4	1464
Limestone, brownish buff	15	1479
Limestone, buff to brownish buff	13	1492
Limestone, buff and gray	6	1498
Limestone, buff and grayish buff	5	1403
Limestone, buff (water 1515)	22	1525
Limestone, light buff	15	1540

Shot with 20 qts. at 630-640
Shot with 20 qts. at 682-687

Completed: 4-18-31

Oceola (Livingston County)

F. W. Kehlet

P. J. O'Conner #1 Permit #1280

Drilling Contractor: Smith Petroleum Co.

Location: SE¼/NW¼/SE¼ of section 31, T.3N., R.5E. 1800' from the south and 1570' from the east line of quarter section.

Elevation: 955 feet above sea level.

Record by R. B. Newcombe from driller's log and samples.

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift: - gas to burn	166	166
MISSISSIPPIAN:		
Coldwater:		
Sandstone, shaly, gray, rusty, limy	9	175
Shale, gray, sandy, sticky	15	190
Shale, gray, sandy	45	235
Sunbury:		
Shale, black, greenish limy layers, pyrite near the bottom	12	247
Berea:		
Sandstone, white, brown, tight, pyritic, with black shale cavings (show of oil & very small gas show 352-65)(3 bailers water per hour 265-285)	33	280
Sandstone, tightly cemented, gray, brown, micaceous	7	287
Shale, gray, soft	8	295
Sandstone, light brown, tightly cemented, calcareous near bottom, micaceous (show oil & gas 305-320)	35	330
Bedford:		
Gray shale, hard and soft	105	435
MISSISSIPPIAN AND DEVONIAN:		
Antrim:		
Shale, black and brown, pyritous (5 bailers water, 550-560)	125	560
Shale, blue gray, calcareous, pyritous	15	575
Shale, black and brown	50	625
DEVONIAN:		
Traverse:		
Dolomite, brown, bituminous (show gas 626)	10	635

Page 2 - Oceola (Livingston County)
#2-Kehlet - O'Conner #1

	Thickness (Feet)	Depth (Feet)
Shale, black, dolomitic spores (water 635-640)	5	640
Shale, blue gray, calcareous	50	690
Limestone, gray	10	700
Limestone, buff, white chert	40	740
Limestone, gray and some buff, fossiliferous	60	800
Shale, blue	5	805
Limestone, blue, gray, shaly, fossiliferous	50	855
Shale, blue, soft	30	885
Limestone, blue, gray, shaly, fossiliferous	30	915
Shale, gray, limy, soft	50	965
Dundee:		
Limestone, buff	60	1025
Limestone, buff, brown, crystalline, porous (show live oil - 3 gal., and little gas - 1029; ½ bailer of water 1045-55)	30	1055
Limestone, gray, buff, sandy	10	1065
Limestone, yellowish buff, sandy (black water 1075)	25	1090
Limestone, brownish buff, sandy	22	1112
Limestone, gray buff, slightly sandy	37	1149
Limestone, white buff, sandy	26	1175
Detroit River:		
Limestone, dolomitic, buff, granular	12	1187
Limestone, buff, white, iron stained, dolomitic, cherty	35	1222
Dolomite, buff, gray, granular and cherty; anhydrite, white (water 1540-50)	353	1575
Dolomite, gray, buff, sandy	25	1600
Dolomite, buff, porous, sandy	30	1630
Dolomite, gray, buff, sandy	10	1640
Sylvania:		
Sandstone, gray buff, tightly cemented	5	1645
Sandstone, white, grains frosted and well rounded	25	1670
(H.F.W. - black sulfur water at 1650)		
Sandstone, gray, angular grains, dolomitic cement, iron stained	32	1702
Sandstone, brown to gray, speckled, tightly cemented, cherty, calcareous	18	1720
Limestone, dolomitic, gray buff, sandy	10	1730
Sandstone, white, fine grained, fairly well cemented	13	1743
(Black water 1735-1743)		

Page 3 - Oceola (Livingston County)
#2-Kehlet - O'Conner # 1

Casing record:
10" 166'
8¼" 288'
6-5/8" 804'

Commenced: 5-1-32
Completed: 9-28-32
Plugged and abandoned: 10-6-32
Dry hole.

Genoa Twp. (Livingston County)

White Star Refining Company
Francis Shields #1 Permit # 1308
Drilling Contractor: C. A. Smith, Jr.

Location: NW¼ of NW¼ of SW¼ of section 6, T. 2N., R. 5E. 325 feet from north and 215 feet from west line of quarter section.

Elevation: 922 feet above sea level.

Record by: R. B. Newcombe from driller's log and samples.

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift	111	111
MISSISSIPPIAN:		
Coldwater:		
Shale, hard, blue, sandy, some lime in cuttings (gas enough to burn, at 135)	28	139
Sunbury:		
Shale, black, cuttings coarse (water 135-140)	12	151
Berea:		
Sandstone, brown, pyritic, lime cement, black shale cavings (show oil 170-175)	44	195
Bedford:		
Shale, gray, soft	15	210
Sandstone, brownish, shaly	10	220
Shale, gray, hard, somewhat limy	15	235
Shale, hard, sandy, pink grains (conglomeratic ?)	5	240
Shale, gray, varying hard and soft, sandy and limy	85	325
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, black and dark brown, pyritous	130	455
Shale, blue gray, somewhat limy	35	490
Shale, brown, pyritous	25	515
Shale, gray, brown, somewhat limy	15	530
Shale, brown, pyrite	3 (5)	533 (535)
DEVONIAN:		
Traverse: (top 533 SIM)		
Limestone, light brown, sandy, granular, dolomitic, bituminous (small show gas 533-35; HFW 535-40, within 125' of top, 10 bailers per hour)	12(10)	545
Shale, gray, limy	40	585

Page 2 - Genoa Twp. (Livingston County)
White Star Refining Co. - Francis Shields #1

	Thickness (Feet)	Depth (Feet)
Limestone, gray and buff	30	615
Limestone, light buff, cherty	15	630
Limestone, gray to buff	75	705
Shale, gray	5	710
Limestone, gray	40	750
Shale, gray	30	780
Limestone, gray buff, sandy	10	790
Shale, gray	10	800
Limestone, gray	15(10)	815(810)
Bell:		
Shale, gray	51(55)	866(865)
Dundee:		
Limestone, gray to buff, hard calcitic pyritous top, some chert, fossiliferous	14(15)	880
Limestone, light buff (show of oil 885-90, little gas - enough to burn constantly 930-35)	65	945
Limestone, buff, drills very fine	5	950
Limestone, buff	15	965
Limestone, bluish buff, sand grains (small amount of water - soon exhausted 970-80)	35	1000
Limestone, brownish buff (oil and gas show 1010-15)	20	1020
Limestone, buff to blue gray, sand grains increasing near bottom	20	1040
Limestone, buff, porous	15	1055
Limestone, light buff, drills fine (some black water at 1065-1080)	15	1070
Detroit River:		
Limestone, dolomitic, light brown	25	1095
Dolomite, brown to light buff, granular, cherty (show of oil 1100-1110)	45	1140
Dolomite, brown; anhydrite, white	10	1150
Dolomite, brown	15	1165
Dolomite, light brown, buff, gray and anhydrite, white (gas 1340-45)	315	1480
Dolomite, gray buff, iron stained, sandy	40	1520
Sandstone, yellowish buff, dolomitic	5	1525
Dolomite, gray buff, sandy	20	1545
Dolomite, gray buff, sandy, drills very fine	10	1555
Sylvania:		
Sandstone, white, fine	5	1560
Sandstone, white, coarser (black water 1545-70)	10	1570
Sandstone, white, fine	30	1600

Page 3 - Genoa Twp. (Livingston County)
White Star Refining Co. - Francis Shields #1

	Thickness (Feet)	Depth (Feet)
Dolomite, light brown, sandy and cherty (black water at 1600-20)	20	1620
Sandstone, light brown, dolomitic, fine	5	1625
Sandstone, dolomitic (sample full of iron)	10	1635
Sandstone, white, grains small and tightly cemented, some dolomite iron stained (black water 1645-70; gas 1640-45)	35	1670
Sandstone, grains white and yellow, fine, iron stained (black water 1680-1700)	30	1700

Case record:
10" 155'
8-1/4" 250'
6-5/8" 860'
5-3/16" 1627'

Commenced: 6-30-32
Completed: 8-11-32
Initial Production: Dry hole
Plugged and abandoned: 8-24-32

Howell Twp. (Livingston County)

Duck Lake Oil Corporation
McPherson Est. #1 Permit #2179
Drilling Contractor: Talbot Oil Company

Location: NE¼ NE¼ NW¼ section 35, T. 3N., R. 4E. 330' from north and 390' from east line of quarter section

Elevation: 914.1 feet above sea level

Record by: L. Hale from driller's log and incomplete samples below 70'.

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Clay, quicksand & gravel	36	36
Gravel & sand	34	70
Sand, gray & some gravel; some well cemented, shaly sandstone	40	110
MISSISSIPPIAN:		
Berea:		
Sandstone, gray brown, shaly, well cemented, micaceous; and some gray sandy dolomite	90	200
Bedford:		
Shale, light gray, sandy & micaceous gray, flaky shale & gray dolomite	85	285
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, black to brown, hard	113	298
Shale, black, hard; light gray, dolomitic shale; pyrite	44	442
Shale, gray, dolomitic, massive	11	453
Shale, brown, flaky, hard; light gray shale; occasional dolomite	44	497
No samples: Driller's log - "Shale, brown"	7	504
DEVONIAN:		
Traverse:		
No samples: Driller's log - "Traverse lime (Hole full salt water 504)"	5	509
Dolomite, brown, crystalline	21	530
No samples: Driller's log - "Shale"	3	533
No samples: Driller's log - "Limestone, broken"	5	538
Limestone, light gray, shaly; some gray shale	13	550

Page 2 - Howell Twp. (Livingston County)
Duck Lake Oil Corporation
McPherson Est. #1

	Thickness (Feet)	Depth (Feet)
No samples: Driller's log -"Limestone, broken"	16	566
No samples: Driller's log -"Limestone, white"	20	586
No samples: Driller's log -"Limestone"	14	600
Dolomite, gray, hard, crystalline; some gray chert	7	607
No samples: Driller's log -"Limestone"	18	625
Limestone, gray, dense, shaly	11	636
Limestone, gray; gray dolomite; gray & buff chert	5	641
Limestone, gray, crystalline to dense; occasional fossils	81	722
Shale, light gray, soft & powdery	10	732
No samples: Driller's log - "Shale, gray"	18	750
Limestone, gray brown, dense, fossiliferous	6	756
No samples: Driller's log -"Limestone, brown"	7	763
No samples: Driller's log - "Shale, gray"	7	770
Shale, gray, fossiliferous, limy; and gray limestone	6	776
Limestone, buff, dense, dolomitic; secondary calcite crystals	10	786
No samples: Driller's log -"Shale, gray"	24	810
No samples: Driller's log -"Shale"	7	817
Shale, gray, limy, fossiliferous; and some limestone	7	838
Dundee:		
No samples: Driller's log -"Limestone"	14	852
Driller's log - "Limestone, brown"	6	858
Limestone, buff, dolomitic; occasional fossils	6	864
Driller's log - Limestone, brown (Gas 885)	28	892
Limestone, buff & light brown, dolomitic, crystalline	31	923
Driller's log - "Limestone, gray"	7	930
Driller's log - "Limestone, gray, hard"	7	937
Detroit River:		
Limestone, light gray & buff, dense to crystalline; a little dolomite	21	958
Driller's log -"Limestone, gray, hard"	6	964
Driller's log -"Limestone"	7	971
Dolomite, buff & gray, crystalline	17	988
Driller's log -"Limestone"	21	1009

Page 3 - Howell Twp. (Livingston County)
Duck Lake Oil Corporation
McPherson Est. #1

	Thickness (Feet)	Depth (Feet)
Dolomite, buff, crystalline	7	1016
Driller's log - "Limestone (show oil 1016-24; 3 bailers salt water per hour 1037)"	234	1250
Driller's log - "Limestone, brown"	27	1277
Driller's log - "Limestone, gray"	39	1316
Driller's log - "Limestone, brown"	34	1350
Driller's log - "Limestone, gray"	24	1374
Limestone, gray, dense; & gray, limy shale	10	1384
Driller's log - "Limestone, gray"	4	1388
Driller's log - "Limestone, brown"	58	1446
Dolomite, light brown crystalline; light gray cherty dolomite	12	1458
Driller's log - "Limestone, brown"	4	1462
Driller's log - "Limestone, variegated"	18	1480
Dolomite, light brown, finely crystalline	5	1485
Driller's log - "Limestone, variegated"	22	1507
Dolomite, light brown, dense with much secondary dolomite; some white gypsum	12	1519
Dolomite, brown & gray brown, crystalline	131	1650
Sylvania:		
Dolomite, gray brown, crystalline; and white, well cemented cherty sandstone	5	1655
Driller's log - "Limestone, sandy" (Hole full water 1662)	33	1688
Driller's log - "Sandstone, white"	6	1694
Dolomite, gray, brown, crystalline; and gray, fine grained angular sandstone	6	1700
Sandstone, gray, fine grained, angular; a little dolomite	17	1717
Dolomite, brown, crystalline, sandy	6	1723
Driller's log - "Sandstone, white"	13	1736
Sandstone, white, fine grained, angular; a little dolomite	10	1746
Driller's log - "Limestone, gray, hard"	10	1756
Sandstone, gray, well cemented with a dolomitic cement	11	1767
Sandstone, gray, friable, very fine to medium grained, angular; some cemented sandstone, some glassy quartz	6	1773

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Duck Lake Oil Corporation
McPherson Est. #1

	Thickness (Feet)	Depth (Feet)
Driller's log - "Limestone, gray"	28	1801
Dolomite, cherty, gray & buff; gray, hard sandstone	6	1807
Sandstone, gray, friable, fine grained, angular; some cemented dolomitic sandstone	10	1817
SILURIAN:		
Bass Island:		
Driller's log - "Limestone, gray"	9	1826
Dolomite, brown, crystalline; and buff & brown cherty limestone	7	1833
Dolomite, gray, brown & buff, cherty; gray & buff chert	27	1860
Dolomite, brown, dense to crystalline	11	1871
Driller's log - "Limestone, brown and white	9	1880
Dolomite, brown, crystalline - drills up as fine particles	7	1887
Dolomite, gray, dense to finely crystalline	13	1900
Dolomite, brown, crystalline, porous	14	1914
Dolomite, dense, gray to buff, hard; some light brown, crystalline dolomite	32	1946
Dolomite, gray, shaly, hard; and some chert	21	1967
Dolomite, gray brown, dense, hard	21	1988
Dolomite, brown & gray brown to light brown, dense	62	2050
Dolomite, light brown, dense with secondary dolomite; a little gypsum	16	2066
Dolomite, brown, light brown & gray, hard; some gypsum	165	2231
Dolomite, gray, shaly; a little gray shale	18	2249
Dolomite, light brown, dense	51	2300
Dolomite, light brown; and gray, shaly dolomite	12	2312
Dolomite, gray, shaly	12	2324
Dolomite, light brown & gray; a little gypsum	7	2331
Salina:		
Dolomite, light brown & gray; and salt	12	2343

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Duck Lake Oil Corporation
McPherson Ext. # 1

	Thickness (Feet)	Depth (Feet)
Salt, white; a little dolomite; a little shale	36	2379
Shale, gray; some dolomite; salt	23	2402
Salt, white	12	2414
Shale, greenish gray; and red shale	11	2425
Shale, gray; a little red & a little brown shale; a little dolomite	35	2460
Salt; some gray shale; a little dolomite	51	2511
Shale, gray, hard, slightly dolomitic	29	2540
Salt; and some gray shale	83	2623
Dolomite, brown & gray, shaly; some porous dolomite	33	2656
Salt; some gray, shaly dolomite; some light brown dolomite	119	2775
Dolomite, brown, finely crystalline	17	2792
Dolomite, light brown; some salt; a little shale	10	2802
Driller's log - "Shale & salt"	10	2812
Salt	11	2823
Dolomite, gray, shaly; some salt	24	2847
Salt	37	2884
Dolomite, brownish-gray, shaly	77	2961
Dolomite, light brown, dense; a little gray, shaly dolomite	36	2997
Driller's log - "Limestone"	20	3017
Dolomite, light brown, dense	9	3026
Salt	9	3035
Shale, gray, dolomitic; and dolomite	75	3110
Salt	26	3136
Driller's log - "Lime & salt"	11	3147
Dolomite, gray, dense, shaly; some salt	10	3157
Salt; with some dolomite	296	3453
Dolomite, brown, shaly, dense	85	3538
Limestone, gray & gray brown, shaly; and dolomite	25	3563
Limestone, gray, massive	87	3650
Dolomite, light brown & buff, dense	26	3676
Salt; with some dolomite & shale	63	3739
Salt, white	137	3876
Dolomite, dark brown & buff, hard	28	3904

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Duck Lake Oil Corporation
McPherson Est. #1

	Thickness (Feet)	Depth (Feet)
Dolomite, gray, limy	13	3917
Driller's log - "Limestone"	8	3925
Gypsum; and gray & brown dolomite	13	3938
Dolomite, gray, hard (150,000 cu. ft. gas 3943-58)	15	3953
Dolomite, brown, hard	5	3958
Dolomite, light brown & gray brown, dense to crystalline	12	3970
Niagaran Series:		
Guelph:		
Dolomite, gray to white, crystalline; some gray brown dolomite	15	3985
Dolomite, light gray to white, crystalline	132	4117
Clinton(?):		
Dolomite, light brown & gray; & gray-brown shale	16	4133
Dolomite, red & gray, crystalline; hard, gray shale	24	4157
Dolomite, gray; and gray shale	12	4169
Shale, red; some gray shale; some gray dolomite	10	4179
Dolomite, gray, crystalline; gray shale; a little red shale	32	4211
Shale, gray; and some gray & brown dolomite	17	4228
Dolomite, gray & brown-gray crystalline	10	4238
Dolomite, gray, crystalline; a little gray shale; a little chert	37	4275
Dolomite, white to buff crystalline; gray shale; some green & a little red shale	24	4299
Cataract:		
Shale, gray, dolomitic, fossiliferous; some dolomite	91	4390
Dolomite, dark brown, hard; some shale	68	4458
Shale, gray & purplish brown; a little dolomite	117	4575
ORDOVICIAN;		
Cincinnatian Series:		

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Duck Lake Oil Corporation
McPherson Est. #1

	Thickness (Feet)	Depth (Feet)
Shale, dark gray, hard, flaky & splintery; some dense, gray dolomite	191	4766
Shale, dark gray, hard; some hard, brown shale	24	4790
Driller's log - "Shale, blue"	21	4811
Shale, reddish brown, hard; some gray shale	12	4823
Shale, dark gray, hard, flaky	14	4837
Shale, dark gray, flaky; some brown, flaky shale	8	4845
Shale, dark gray, splintery; with occasional red & brown splintery shale	138	4983
Trenton:		
Dolomite, brown, crystalline; some gray, splintery shale	3	4986
Dolomite, brown, crystalline; some gray, splintery shale	3	4986
Limestone, brown & buff, dolomitic; gray splintery shale; some dolomite	22	5008
Driller's log - "Limestone, brown"	376	5384
Driller's log - "Limestone, black"	422	5885
St. Peters:		
Driller's log - "Limestone, sandy, gray"	10	5895
Driller's log - "Sandstone, gray (water 5895; salt water 5900-10)	39	5934
Driller's log - "Sandstone, white"	17	5951
Driller's log - "Limestone & sand"	7	5958
Plugged back to		3950

Casing Record:
18" 116'
14" 236'
10" 718'
8¼" 1990'
6-5/8" 4985'

Commenced: 9/18/34
Completed: 3/15/35
Initial Production: Dry hole
Shot: 80 quarts from 3929½-3950 after plug back.
Initial Production: 478,000 cu. ft. gas after shot.

Hartland (Livingston County)

Voorhees-Drilling Company

Internations Migratory
Bird Preserve # 1 — Permit # 8783

Drilling Contractor: Company Tools

Location: NE¼ NW¼ NE¼ section 24, T.3N., R.6E.
330' from north and 1520' from east line of quarter section

Elevation: 1056.8 feet above sea level

Record by: L. Esch from driller's log and samples 330-1444

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Drift	330	330
MISSISSIPPIAN:		
Coldwater:		
Shale, light gray, muddy	34	364
Shale, light gray, very sandy, micaceous (water 367-377)	6	370
Shale, gray, muddy, soft; some hard flaky shale	330	700
Shale, red, muddy	20	720
Shale, red and gray, muddy	5	725
Sunbury:		
Shale, dark gray to brownish-black, soft, flaky; a little harder shale	17	742
Berea:		
Sandstone, gray, very fine grained well cemented; gray, flaky shale	4	746
Sandstone, gray, very fine grained; a trace of shale	10	756
Sandstone, gray, very fine grained; and gray mud	4	760
Shale, gray - both muddy and flaky	21	781
Sandstone, light gray and brown, very fine grained, well cemented a little shale	5	786
Sandstone, gray with a light brown dolomitic cement	7	793
Sandstone, light brown, dolomitic, well cemented; some micaceous shale	17	810

Page 2 - Hartland (Livingston County)
Voorhees Drilling Co. - International Migratory Bird Preserve # 1

	Thickness (Feet)	Depth (Feet)
Sandstone, light gray, micaceous, well cemented	10	820
Shale, gray, flaky, micaceous; some sandstone	8	828
Sandstone, gray, micaceous; and some gray shale	37	865
Bedford:		
Shale, gray, flaky; some sandy dolomite	65	930
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, black to brown; a little dolomitic limestone	21	951
Shale, black to brown; some shale with a few spore cases	104	1055
Shale, black with spores; some light gray shale; a little dolomite; a little pyrite	35	1090
DEVONIAN:		
Traverse:		
Dolomite, light brown, dense to crystalline and black shale	5	1095
Dolomite, brown, crystalline	6	1101
Dolomite, brown; and gray, muddy, shale	8	1109
Shale, gray, muddy; some flaky hard shale	17	1126
Shale, gray, limy; some dolomite limestone	8	1134
Limestone, grayish-buff, dense; some chert and some gray shale	16	1150
Limestone, brownish-gray, shaly; a little shale	7	1157
Limestone, grayish-brown, dense; light brown chert; and light brown crystalline dolomite	7	1164
Limestone, grayish-brown to buff, dense; some crystalline limestone	11	1175
Chert, white to buff; and buff limestone	5	1180
Chert, white, weathered; and light brown, broken crystalline dolomite (Water 1190-05)	16	1196
Chert, gray and white-both weathered and fresh; some brown, crys-		

Page 3 - Hartland (Livingston County)
Voorhees Drilling Co. - International
Migratory Bird Preserve #1

	Thickness (Feet)	Depth (Feet)
talline dolomite; some cherty limestone	11	1207
Limestone, grayish-brown, dense, fossiliferous	18	1225
Limestone, brown, dense	10	1235
Limestone, brown to white, dense; a little chert	7	1242
Limestone, buff and grayish-buff, dense, fossiliferous	17	1259
Shale, gray, muddy, limy	39	1298
Limestone and shale, gray, fossiliferous	17	1315
Shale, gray, muddy, limy	51	1366
Limestone, gray, fossiliferous	12	1378
Shale, gray, muddy, limy	55	1433
Limestone, grayish-brown to buff, dense, traces of shale	11	1444
No further samples		
Dundee:		
Dundee lime, hard	166	1610
Detroit River:		
Monroe lime, brown, hard (Hole full black water at 1635; show gas 1735-50)	205	1815

Casing record:
14" 335'
10" 785'
8¼" 1441'

Commenced: 7-25-41
Completed: 8-25-41
Initial Production: Dry hole

Hartland (Livingston County)

Fisher-McCall Oil and Gas, Inc.
M. Hibner # 1 Permit # 9426

Drilling Contractor: Company Tools

Location: C SW¼ NE¼ section 14, T. 3N., R. 6E.
660 feet from south and 660 feet from west line of quarter section

Elevation: 989. feet above sea level

Record by: L. Esch from driller's log and samples 300-1768

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Drift	300	300
MISSISSIPPIAN:		
Coldwater:		
Shale, gray, muddy and some drift gravel	5	305
Shale, light gray and brown, soft, flaky, micaceous	15	320
Shale, light gray, muddy; occasional brown mud	280	600
Shale, gray-both flaky and muddy	57	657
Sunbury:		
Shale, black, flaky, slightly micaceous and an occasional fossil	18	685
Shale, black; and some fine grained, well-cemented sandstone	20	695
Berea:		
Sandstone, gray, micaceous, dolomitec; some gray shale; some pyrite	5	700
Shale, gray - both flaky and muddy	20	720
Sandstone, gray, well cemented micaceous-somewhat dolomitic	10	730
Shale, gray - both flaky and muddy	10	740
Shale, gray and red, muddy (?(may be misplaced sample)	10	750
Sandstone, gray, well cemented, micaceous; and gray shale	40	790
Bedford:		
Shale, gray, both flaky and muddy	70	860

Page 2 - Hartland (Livingston County)
Fisher-McCall Oil and Gas, Inc.
M. Hibner #1

	Thickness (Feet)	Depth (Feet)
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, black, flaky	10	870
Shale, gray and some mud	20	890
Shale, black, hard	103	993
Shale, black; and light gray shale	17	1010
No samples - drillers log - Shale, brown	20	1030
DEVONIAN:		
Traverse:		
Dolomite, brown, dense to finely crystalline	18	1038
Shale, light gray, muddy, soft, slightly limy; a little hard shale	24	1062
Dolomite, light gray, dense to very finely crystalline and gray chert	7	1069
Limestone, gray, dense, shaly and a little chert	5	1074
Limestone, gray, fossiliferous, dense; a little gray shale	15	1089
Limestone, buff, broken, crystalline; a little shale	9	1098
No samples - Drillers log - Lime, gray	10	1108
Limestone, buff, broken crystalline; a little white chert; somewhat weathered	12	1120
Chert, white, weathered; a little dolomite	5	1125
Limestone, light brown, dense to crystalline; and buff and white chert	3	1128
Limestone, gray and light brown, dense and gray chert	4	1132
Limestone, brown, dense; a little chert	4	1136
Limestone, gray, dense, fossiliferous	15	1151
Limestone, light brown and buff, dense; a little chert	29	1180
Limestone, grayish-brown and buff, dense, fossiliferous; a trace of gray shale	7	1187
Shale, light, gray, muddy, limy	38	1225
Limestone, gray and grayish-brown, shaly, fossiliferous; some limy shale	25	1250

Page 3 - Hartland (Livingston County)
Fisher-McCall Oil & Gas, Inc.
M. Hibner # 1

	Thickness (Feet)	Depth (Feet)
Shale, light gray, muddy, limy	45	1295
Limestone, grayish-brown, fossiliferous	19	1314
Shale, light gray, limy-both flaky and muddy	7	1321
Shale, gray, limy and fossiliferous-lime	15	1336
Shale, light gray, limy - both flaky and muddy	34	1370
Limestone, gray, fossiliferous; a little buff, dense limestone	10	1380
Dundee:		
Limestone, buff, dense; a little gray shale	10	1390
Limestone, buff, dense to broken crystalline	95	1485
Limestone, light brown to buff-dense to broken crystalline	13	1498
Limestone, buff, dense; a trace of gray shale	8	1506
Limestone, buff, dense; a little secondary calcite; a trace of shale	21	1527
Limestone, brown, dense, cherty; a little chert	8	1535
No samples - drillers log - Lime, gray and brown	13	1548
Limestone, light brown, dense; a little chert	14	1553
No samples - drillers log-Lime, gray and brown	14	1567
Limestone, light brown; and some chert	4	1571
Limestone, brown, dense; occasional chert	4	1575
Detroit River:		
Limestone, light brown, dense; gypsum; and some mud	10	1585
Dolomite, light brown, gypsiferous and gypsum	7	1592
Dolomite, light brown, very finely crystalline; a little gypsum and trace of glauconite	9	1601
Dolomite, light brown, finely crystalline; some gypsum and mud	12	1613
Dolomite and gypsum	26	1639
Dolomite, light brown, dense; some anhydrite	26	1665

Page 4 - Hartland (Livingston County)
Fisher-McCall Oil & Gas, Inc.
M. Hibner # 1

	Thickness (Feet)	Depth (Feet)
Anhydrite; and some dense dolomite	10	1675
Dolomite, light brown, crystalline; a little anhydrite	17	1692
Limestone, light brown, dense to crystalline; dolomitic; a little anhydrite	22	1714
Dolomite, brown, very finely crystalline	16	1730
Anhydrite; a little dolomite	20	1750
Dolomite, brown; a little anhydrite	5	1755
Dolomite, brown, very finely crystalline, porous	13	1768

Casing Record:
10" 303'
8¼" 609'
6-5/8" 1560'RH

Commenced: 2/10/42
Completed: 3/2/42
Dry Hole

Marion Twp. (Livingston County)

Arthur F. Etienne

J. J. Eisner#1 Permit # 9568

Drilling Contractor: J. H. Van Sice, Agent

Location: NE¼ SW¼ SE¼ section 7, T.2N., R.4E.
990 feet from south and 990 feet from west line of quarter section

Elevation: 940.6 feet above sea level

Record by: L. Esch from driller's log & samples 140-2272

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Drift	140	140
MISSISSIPPIAN:		
Michigan(?):		
Mud, green & some dolomite; a little sandstone	5	145
No record	13	158
Shale, gray, flaky; & brown, blocky-somewhat sandy micaceous dolomite	2	160
Dolomite, brown, crystalline; a few grains of cemented sandstone; a little pyrite	10	170
Napoleon:		
Sandstone, gray, fine to medium grained, angular; a little limestone; a little pyrite	20	190
Sandstone, gray, medium grained sub-angular, cloudy, a trace of limestone	25	215
No samples - Driller's log - Upper Marshall	3	218
Mud, gray; some shale & sandstone; a little dolomite	7	225
Shale, gray, flaky; some brown, dense dolomite; a little sandy dolomite	20	245
Dolomite, light brown with embedded sand grains; a trace of shale	10	255
Sandstone, gray, very fine grained to medium grained sub-angular	15	270
Sandstone, fine grained, sub-angular; some gray shale; some very sandy, micaceous shale	5	275
Sandstone, gray, fine grained, angular; a little mica	27	302
Sandstone, gray, fine grained; a little shale	6	308

Page 2 - Marion Twp. (Livingston County)
Arthur F. Etienne - J. J. Eisner # 1

	Thickness (Feet)	Depth (Feet)
Sandstone, gray, medium grained, angular; a little mica	7	315
Sandstone, gray to tan colored (rust-stained) very fine to medium grained, angular	35	350
Sandstone, gray, coarse to medium grained, rounded to sub-angular; a little dolomite with a trace of glauconite	8	358
Lower Marshall(?):		
Sandstone, (iron stained) very fine grained to medium grained	60	418
Shale, muddy, very fine grained sand-stone; a little micaceous shale	22	440
Sandstone, gray, very well cemented, micaceous & dolomitic	15	455
Coldwater:		
Shale, gray, flaky, soft, micaceous; a little mud	15	470
Sandstone, light gray, micaceous, cemented in dolomite; some dense dolomite	150	620
Shale, gray, flaky, micaceous; some light gray micaceous well cemented sandstone	55	675
Sandstone, light gray, micaceous, well cemented, shaly; some gray & brown sandy shale	40	715
Shale, gray, flaky, micaceous; & gray & brown sandy shale	195	910
Shale, light gray & brown, very sandy, micaceous	37	947
Shale, gray & light gray & brown, very sandy shale	423	1370
Shale, gray & red, flaky	15	1385
Shale, gray, flaky; a little sandy shale	5	1390
Shale, red & gray, flaky; & light brown, dense dolomite	10	1400
Shale, gray & red; some dolomite	5	1405
Sunbury:		
Shale, dark gray & gray	15	1420
Shale, black	10	1430
Berea:		
Sandstone, light gray, micaceous, well cemented in dolomite; some dark gray shale	10	1440

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Arthur F. Etienne - J. J. Eisner # 1

	Thickness (Feet)	Depth (Feet)
Sandstone, light gray, micaceous-well cemented in dolomite	10	1450
Sandstone, light gray, well - cemented; gray shale; a little dolomite	35	1485
Sandstone, light gray, micaceous, well cemented in dolomite; a little gray micaceous shale	5	1490
Bedford:		
Shale, gray, flaky, somewhat micaceous; & light gray sand-stone	65	1555
Shale, gray, flaky; some dolomite	35	1590
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, black to brown-somewhat micaceous a few spores; occa-sional dolomite	155	1745
Shale, light gray; & gray blocky dolomite; a little pyrite	10	1755
No samples-Driller's log-Shale, gray	4	1759
Shale, black, hard	36	1795
DEVONIAN;		
Traverse:		
Dolomite, light brown, coarsely crystalline; pyrite; & black shale	5	1800
No samples-Driller's log-Shale, brown	7	1807
Shale, gray, flaky, limy; a little dolomite (a few sand grains ? cavings)	2	1809
Shale, gray, flaky	23	1832
Limestone, gray-brown, dense; a little chert	16	1848
Shale, gray, flaky; & gray shaly limestone	12	1860
Traverse Limestone:		
Dolomite, brown, very finely crys-talline	5	1865
Dolomite, buff, broken crystalline	5	1870
Dolomite, buff-drills up as very fine grains; some white chert	5	1875
Limestone & dolomite, light brown, crystalline	5	1880

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Arthur F. Etienne - J. J. Eisner # 1

	Thickness (Feet)	Depth (Feet)
Chert, buff to white; & light brown to buff broken crystalline dolomite	8	1888
Limestone, brown to buff, dense (100' water at 1895)	37	1925
Limestone, buff; some buff chert	3	1928
Limestone, light brown, dense to crystalline	12	1940
Limestone, brown & gray-brown, dense; a few fossils	57	1997
Shale, gray, flaky, limy	23	2020
Limestone, gray-brown, fossiliferous; & gray shale (⅛ bailer water per hour at 2050)	60	2080
Dundee:		
Limestone, brown, very finely crystalline, dolomitic; a little pyrite	5	2085
Limestone, buff, dense; a little pyrite	53	2138
Limestone, darker brown & buff-drills up a very fine grains	7	2145
Limestone, buff & gray-buff, dense	27	2172
Dolomite, brown, very finely crystalline; & buff dense limestone(Hole full water 2185)	22	2194
Limestone, buff, finely crystalline	10	2204
Limestone, light brown, finely crystalline; some dolomitic limestone & dolomite	29	2233
Dolomite, light brown, finely crystalline, porous	15	2248
Detroit River:		
Dolomite, light brown to buff, finely crystalline	12	2260
Dolomite & limestone, light brown, finely crystalline; a little gypsum	5	2265
Dolomite, gray & brown, slightly gypsiferous	7	2272
No record	14	2286

Casing record:
10" 160'
8¼" 430'
5-3/16" 1941'

Commenced: 5/19/42
Completed: 8/3/42
Initial Production:
Dry Hole

Oceola Twp. (Livingston County)

H. C. Nelson

Lewis R. Walker #1 Permit #9782
Drilling Contractor: Riley Drilling Co.

Location: SE¼ NW¼ NW¼ section 33, T.3N., R.5E. 933.4 feet from north and 933.4 feet from west line of quarter section.

Elevation: 980.3 feet above sea level

Record by: L. Esch from driller's log & samples 205-1130

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Drift	205	205
MISSISSIPPIAN:		
Coldwater:		
Shale, gray, muddy	20	225
Shale, gray, sandy & micaceous	20	245
Shale, gray to brown, muddy	60	305
Shale, light gray & brown, very sandy & micaceous	20	325
Shale, light gray & brown, muddy	20	345
Sunbury:		
Shale, black, slightly micaceous	10	355
Berea:		
Sandstone, dark gray, micaceous, well cemented; a little shale	10	365
Sandstone, light gray, well cemented with a dolomitic cement, a little gray shale; & sandy shale	20	385
Shale, gray to light brown, sandy, micaceous; some gray flaky shale	10	395
Shale, gray, both flaky & muddy	10	405
Sandstone, dark gray, micaceous, well cemented; & sandy shale	30	435
Dolomite, light gray, micaceous, dense; & some shale, both flaky & muddy	10	445
No samples - Drillers log-Lime, sandy	10	455
Shale, dark gray with some spores (looks like Antrim?)	10	465
Bedford:		
Shale, light gray, muddy	30	495
Dolomite, light gray, micaceous; a little gray shale	25	520

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H. C. Nelson - Lewis R. Walker #1

	Thickness (Feet)	Depth (Feet)
Shale, gray, flaky, micaceous; a little sandy shale & dolomite	17	537
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, black to brown	134	671
Shale, light gray & greenish-gray-somewhat micaceous, some dense dolomite & dark gray shale	7	678
Shale, black to brown	13	691
Shale, black, a little light gray shale & dolomite	19	710
Shale, black to brown; a few spores	27	737
DEVONIAN:		
Traverse:		
Dolomite, light brown, crystalline; (show water 740-45)	18	755
Shale, gray, limy	10	765
No samples-Drillers log-Shale, gray	5	770
Drillers log - Lime, brown	10	780
Limestone, buff, dense, fossiliferous; & buff chert	5	785
Limestone, grayish brown, dense & some chert; a little gray shale	23	808
Limestone, gray-buff, dense; a little chert	17	825
Limestone, light brown to buff, broken crystalline-trace of chert	12	837
Limestone, light brown, dense; porous-somewhat weathered; & broken crystalline limestone	5	842
Limestone, grayish-brown, & light brown, dense, fossiliferous; a little chert	98	940
Limestone, gray, dense, shaly; a few fossils	28	968
Bell ?:		
Shale, gray, flaky, soft	19	987
No samples - Drillers log - Shale, blue	5	992
Limestone & shale	43	1035
Shale, gray, flaky; some fossiliferous limestone	44	1079
Shale, gray, flaky; fossiliferous lime & a trace of buff, dense limestone	7	1086

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H. C. Nelson - Lewis R. Walker #1

	Thickness (Feet)	Depth (Feet)
Dundee:		
Limestone, light brown, dense; and gray & grayish-brown shaly limestone	7	1093
No samples - Drillers log - Shale, gray & lime	2	1095
Drillers log - Lime, buff, gritty (show of dead oil)	5	1100
Drillers log - Lime, buff	7	1107
Limestone, buff, dense to broken crystalline-(100' water per hour 1125-1130)	23	1130

Casing record:
10" 205'
8¼" 505'

Commenced: 9/21/42
Completed: 10/9/42
Initial Production: Dry Hole

Iosco Twp. (Livingston County)

J. T. Norris

Ward A. Stowe #1 Permit #10038

Drilling Contractor: T. H. Riley

Location: C SW¼ SW¼ section 9, T.2N., R.3E. 660' from south and 630' from west line of quarter section.

Elevation: 927.5 feet above sea level.

Record by: L. Esch from driller's log and samples 81-2080.

	Thickness (Feet)	Depth (Feet)
No record	81	81
MISSISSIPPIAN:		
Michigan: (?)		
Sandstone, gray, medium-gray - both friable and partially cemented and gray mud	4	85
Shale, gray, muddy	5	90
Shale, gray, muddy-somewhat micaceous	15	105
Napoleon:		
Sandstone, gray, medium grained, partially cemented; some coarse grains - somewhat conglomeratic; some black shale	20	125
Sandstone, medium grained, angular-both friable and partially cemented; a trace of light gray, sandy, micaceous shale	15	140
Sandstone, medium grained, sub-angular slightly cloudy	24	164
Sandstone, medium grained; angular to sub-angular-both friable and partially cemented with a limy cement	46	210
(?)Shale, gray, fissile, soft; a little sandstone	5	215
Sandstone, gray-both friable and cemented with a limy cement; a variety of minerals	5	220
Sandstone, gray-both friable and cemented	13	233
Lower Marshall:		
Shale, gray, muddy and sandstone	11	244

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J. T. Norris - Ward A. Stowe # 1

	Thickness (Feet)	Depth (Feet)
Sandstone, gray, very fine grained, well cemented with a dolomitic cement	13	257
Dolomite, light gray, shaly, sandy; some gray mud	23	280
Sandstone, gray, slightly micaceous; cemented in dolomite; a little dolomite and shale; occasional ostercods	32	312
Coldwater:		
Shale, gray, flaky, micaceous; some mud	13	325
Shale, gray, flaky, micaceous; a little well cemented sandstone	15	340
Shale, light gray, very sandy, micaceous, dolomitic; some dolomite	10	350
Shale, gray - both hard and flaky, and muddy; a little darker organic shale	165	515
Shale, light gray, sandy, micaceous; a little light brown hard shale	5	520
Shale, gray, flaky, micaceous; some gray mud	17	537
Shale, light brown, very sandy, micaceous and dolomitic a trace of dolomite	17	554
Shale, gray, flaky, micaceous and a little mud	51	605
Shale, gray and light brown, micaceous very sandy, dolomitic	18	623
Shale, gray, flaky; a little brown hard shale; occasional mud	82	705
Dolomite, brownish-gray, hard, micaceous; a little gray, flaky shale	15	720
Shale, gray - both flaky and muddy; a little brown hard shale	41	761
Dolomite, gray, shaly and gray, micaceous shale	8	769
Shale, gray, flaky; a little mud	52	821
Dolomite, light gray, and brownish-gray; sandy, micaceous	5	826
Shale, gray; dolomitic sandy, micaceous shale; a trace of red shale	35	861
Shale, light gray, sandy, dolomitic, micaceous	14	875
Shale, gray, flaky; a little hard brown shale	150	1025
Shale, dark red and brownish-gray; a little gray shale; traces of dolomite	10	1035
Shale, gray, flaky, micaceous; and brown, hard shale	14	1049
Shale, gray, flaky, micaceous	36	1085

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J. T. Norris - Ward A. Stowe #1

	Thickness (Feet)	Depth (Feet)
Shale, light gray, sandy, micaceous; some flaky, micaceous shale	35	1120
Shale, gray, very sandy; some flaky shale; a few fossils; a few quartz grains (cavings?)	25	1145
Shale, light gray, micaceous; a little brown, hard shale	11	1156
Shale, gray, flaky, micaceous, hard	85	1241
Sandstone, gray and brown, very fine grained; a little gray shale	13	1254
Shale, gray, flaky; and light gray sandy, micaceous dolomitic shale	6	1260
Shale, dark red, flaky	6	1266
Shale, gray, flaky; and light gray sandy shale	5	1271
Dolomite, light brown, dense; a little shale	3	1274
Dolomite, light brown, dense and light gray very sandy micaceous shale; some flaky shale	3	1277
Shale, gray, flaky	5	1282
Shale, gray, flaky; and gray dense dolomite	5	1287
Sunbury:		
Shale, black	10	1297
Shale, black and some light gray well cemented dolomitic	5	1302
Berea-Bedford:		
No sample - Driller's log	4	1306
Sandstone, light gray, micaceous partially cemented	8	1314
Shale, gray, flaky; a little micaceous shale; some well cemented sandstone	15	1329
Shale, gray and light brown and light gray well cemented sandstone and sandy shale	19	1348
Sandstone, light brown, well cemented micaceous; dolomitic; a little gray shale	37	1385
Sandstone, light reddish-brown, well cemented, micaceous; a little gray shale	6	1391
Sandstone, light gray, very dolomitic-slightly micaceous; a little gray shale	11	1402
Shale, gray, flaky; and light brown to light gray, dolomitic sandstone	30	1432
Shale, gray, flaky; a little dolomite	18	1450

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J. T. Norris - Ward A. Stowe #1

	Thickness (Feet)	Depth (Feet)
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, black, hard; a trace of gray shale	7	1457
Shale, black; a few spore cases	130	1587
Dolomite, light gray, hard; and some gray, flaky shale	6	1593
No sample	9	1602
Shale, black, hard	29	1631
Shale, black; some dark dolomite	5	1636
Shale, black	15	1651
Dolomite, gray and gray-brown, dense gray shale and drift cavings	8	1659
Shale, dark gray, hard	5	1664
Shale, dark gray; and hard brown dolomite and pyritic dolomite	6	1670
No sample	5	1675-1681

Correction 1675 - 1681 SIM

DEVONIAN:		
Traverse:		
Shale, light gray; gray dolomite; & some black shale at		1681
Shale, light gray, dolomitic; and light gray dolomite	9	1690
Dolomite, light gray; and light gray chert; some gray shale	3	1693
Shale, light gray, very dolomitic; some gray chert	7	1700
Shale, light gray, dolomitic; some gray chert and some limestone	7	1707
Shale, gray, limy; some dense limestone; a little dolomite	8	1715
Shale, gray, limy; and gray dense limestone	5	1720
Limestone, gray, shaly	5	1725
Shale, gray, limy; and dense shaly limestone	13	1738
Limestone, buff to brown; and buff chert	4	1742
No sample	8	1750
Chert, white; some dolomite; occasional quartz grains	11	1761
Limestone, grayish-brown to buff, dense; a little chert, a few quartz grains	12	1773
Limestone, grayish-brown, dense	8	1781
Limestone, buff, dense; some white chert; a few quartz grains; and limestone, buff to light brown dense to somewhat crystalline	21	1802

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J. T. Norris - Ward A. Stowe #1

	Thickness (Feet)	Depth (Feet)
Limestone, light brown, dense to crystalline, fossiliferous	14	1816
Limestone, light brown and buff; a few fossils	4	1820
Limestone, gray-brown, dense; a few fossils	12	1832
Limestone, gray-brown; a trace of chert	21	1853
No sample	24	1877
Limestone, gray-brown to buff, very fossiliferous	11	1888
Shale, gray, limy, fossiliferous; a few quartz grains (cavings?)	5	1893
Limestone, grayish-brown, dense, fossiliferous	15	1908
No sample	9	1917
Limestone, light brown, dense, fossiliferous; a trace of gray shale	3	1920
Limestone, gray and gray-brown, dense, fossiliferous; some gray shale	9	1929
Limestone, gray-brown, dense; a little shale	5	1934
Limestone, light brown, dense	13	1947
Dundee:		
Limestone, (iron stained)	10	1957
Dolomite, light brown, finely crystalline; and some limestone	2	1959
Limestone, light brown, dense; a trace of organic material	76	2035
Limestone, darker brown to buff, dense	5	2040
Dolomite, light brown, very finely crystalline; a trace of limestone	40	2080
No samples	5	2085
Limestone, light brown, dolomitic; and crystalline dolomite	2	2087
Dolomite, light brown, very finely crystalline	9	2096

Casing record:
10" 81'
8¼" 290'
6-5/8" 1302'
5-3/16" 1947'

Commenced: 3-27-43
Completed: 7-18-43
Initial Production: Dry Hole

Handy Twp., (Livingston County)

Panhandle Eastern Pipe Line Co.
E. C. Addison #1 Permit # 10990
Drilling Contractor: Union Drilling & Producing (Cable)

Location: C W½ NW¼ NW¼ section 11, T.3N., R.3E. 660' from north and 330' from west line of quarter section.

Elevation: 920.2 feet above sea level.

Record by: Panhandle Eastern Pipe Line Co. from samples & D. Myers from Driller's log. (See note at bottom)

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
No samples	60	60
Sand, gray, fine, free, angular	25	85
Clay, gray	10	95
Gravel	10	105
PENNSYLVANIAN:		
Michigan:		
Dolomite, gray to gray brown, very finely crystalline, tight	9	114
Sandstone, gray, fine, angular, tight, dirty	6	120
Sandstone, white, fine to medium, free, angular	58	178
MISSISSIPPIAN:		
Napoleon:		
Sandstone, white, fine, angular, free	34	212
Sandstone, white, fine to coarse, angular, free	46	258
Lower Marshall:		
Sandstone, gray, fine, tight	14	272
Sandstone, gray, very fine, angular free	43	315
Sandstone, gray, fine, tight	17	332
Sandstone, gray, fine, tight, very dolomite	12	344
Sandstone, gray, fine to very fine, free	26	370
Sandstone, gray, fine, tight	13	383
Shale, gray to dark gray, slightly sandy	7	390
Sandstone, gray, fine, free, angular	3	393

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Panhandle Eastern Pipe Line Co.
E. C. Addison # 1

	Thickness (Feet)	Depth (Feet)
Coldwater:		
Shale, gray to dark gray (sandy from 435-50; 520-40)	397	790
Sandstone, gray, fine, tight, shaly	60	850
Shale, gray, sandy and dolomite	467	1317
Shale, maroon and gray	3	1320
Shale, gray, dolomite	23	1343
Sunbury:		
Shale, black, firm	13	1356
Berea:		
Sandstone, gray, fine, angular, tight	10	1366
Sandstone, gray, very fine, tight, argillaceous	9	1375
Shale, dark gray	17	1392
Sandstone, gray, fine, tight, slightly argillaceous	48	1440
Sandstone, gray, fine to very fine, free, angular	15	1455
Bedford:		
Shale, gray, sandy	8	1463
Shale, dark gray	17	1480
Shale, gray, sandy and dolomitic	38(35)	1518(1515)
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, black	144(147)	1662
Shale, gray, dolomitic, some black	38	1700
Shale, black	30(35)	1730(1735)
DEVONIAN:		
Traverse:		
Dolomite, brown to dark brown, finely crystalline, tight (1700' water 1735-60)	20(15)	1750
Shale, light gray, dolomitic	10	1760
Dolomite, gray, very finely crystalline, tight, with gray chert	20	1780
Limestone, gray, finely crystalline, tight, cherty, dolomitic	35	1815
Dolomite, light gray to gray, medium crystalline, tight, with white chert	29	1844
Limestone, drab gray, finely crystalline, tight, argillaceous	16	1860

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Panhandle Eastern Pipe Line Co.
E. C. Addison# 1

	Thickness (Feet)	Depth (Feet)
Dolomite, light gray to white, coarsely crystalline, tight, slightly cherty	15	1875
Limestone, gray, finely crystalline, tight, argillaceous	10	1885
Dolomite, gray, medium crystalline, tight, cherty	5	1890
Limestone, gray, finely crystalline, tight, argillaceous, fossiliferous	45	1935
Shale, dark gray	30	1965
Limestone, dark gray, finely crystalline, argillaceous, fossiliferous	47	2012
Shale, gray (Preliminary report Bell 2016)	18	2030
Limestone, drab gray, finely crystalline, argillaceous, fossiliferous	30	2060
Dundee:		
Dolomite, gray to light gray, finely crystalline, tight, limy	8	2068
Limestone, light gray, finely crystalline, tight, dolomitic (odor oil 2060-80) (200' water in 1 hour-2081')	37	2105
Limestone, light gray to tan, very finely crystalline to dense, tight (hole full water 2130-41)	45	2150
Limestone, gray, finely crystalline to dense, tight	55	2205
Limestone, white, finely crystalline, tight	18	2223
Limestone, dark gray, very finely crystalline, tight	7	2230
Detroit River:		
Dolomite, light gray to tan, very finely crystalline, tight (Hole full water 2227-35')	25	2255
Dolomite, light gray to gray, finely crystalline to finely sucrose, tight (Strong odor oil 2247-71)	10	2265
Dolomite, light gray to gray, finely crystalline to finely sucrose, tight, very cherty	20	2285
Dolomite, gray to tan, very finely crystalline, tight, with anhydrite	7	2292
Anhydrite, gray to brown, dolomitic	13	2305

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Panhandle Eastern Pipe Line Co.
E. C. Addison #1

	Thickness (Feet)	Depth (Feet)
Dolomite, tan, very finely crystalline to finely sucrose, tight	30	2335
Dolomite, tan, very finely crystalline to finely sucrose, tight	10	2345
Dolomite, light gray, very finely crystalline to dense, tight	13	2358
Dolomite, tan, finely crystalline, tight	32	2390
Dolomite, brown, finely crystalline, tight	34	2424
Dolomite, tan, very finely crystalline to dense, with anhydrite	11	2435
Dolomite, tan, finely sucrose, tight, with anhydrite	47	2482
Dolomite, tan, finely sucrose, tight	11	2493
Dolomite, gray to tan, very finely crystalline to dense, tight, with anhydrite	52	2545
Dolomite, tan to brown, finely crystalline, tight	20	2565
Dolomite, tan, finely crystalline with anhydrite	10	2575
Sylvania:		
Dolomite, tan, finely crystalline, faint pinpoint porosity in part, sandy	10	2585
Dolomite, gray, very finely crystalline to dense, tight	13	2598
Dolomite, gray to tan, finely crystalline, faint pinpoint porosity in part, very slight show of oil, sandy	27	2625
Dolomite, gray to tan, finely crystalline, faint pinpoint porosity in part, very slight show of oil, sandy, with some weathered chert, tight	10	2635
Dolomite, gray to brown, finely crystalline, tight, sandy, with little chert	32	2667
Sandstone, white, fine, angular, faint porosity in part, dolomite	18	2685
Dolomite, gray, finely crystalline, very sandy, little weathered chert	21	2706
Sandstone, gray to white, fine, angular, dolomitic (200' water at 2714; fill up 1500' at 2757)	18	2724

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Panhandle Eastern Pipe Line Co.
E. C. Addison #1

	Thickness (Feet)	Depth (Feet)
Sandstone, gray to white, fine, angular, dolomitic, very cherty	9	2733
Sandstone, white, fine, free, angular	14	2747
SILURIAN:		
Bass Island:		
Dolomite, light gray to white, finely crystalline, very cherty (fill up 2000' water at 2780')	37	2784
Dolomite, brown, finely crystalline, tight, little chert	11	2795
Dolomite, light gray, very finely crystalline, tight, (faint odor oil 2800-2854')	5	2800
Dolomite, tan, very finely crystalline, tight	30	2830
Dolomite, gray, finely crystalline tight	5	2835
Dolomite, tan, very finely crystalline, tight	20	2855
Dolomite, tan, very finely crystalline, with little chert	15	2870
Dolomite, light gray, finely crystalline, tight with clear quartz	10	2880
Dolomite, tan, very finely crystalline, tight	10	2890
Dolomite, dark brown, very finely crystalline, tight, cherty	5	2895
Dolomite, light tan, very finely crystalline to finely crystalline, tight	15	2910
Dolomite, dark tan, very finely crystalline, tight with clear chert	20	2930
Dolomite, light gray to gray, finely crystalline, tight	5	2935
Dolomite, tan to light gray, finely sucrose, tight	15	2950
Dolomite, gray, very finely crystalline, tight	10	2960
Dolomite, tan to buff, very finely crystalline, tight	20	2980
Dolomite, light gray, finely crystalline, tight	20	3000
Dolomite, gray, very finely crystalline, tight, with anhydrite	10	3010
Anhydrite, gray, dolomitic	10	3020
Dolomite, gray, very finely crystalline to dense, tight	18	3038

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Panhandle Eastern Pipe Line Co.
E. C. Addison #1

	Thickness (Feet)	Depth (Feet)
Dolomite, gray, very finely crystalline to dense, tight, with anhydrite	12	3050
Dolomite, light gray to tan, very finely crystalline, tight	13	3063
Dolomite, dark gray, finely crystalline, argillaceous	24	3087
Dolomite, dark gray, finely crystalline, argillaceous, with little anhydrite	13	3100
Dolomite, gray, very finely crystalline, tight, argillaceous, with some maroon, dolomite	25	3125
Dolomite, gray to light gray, very finely crystalline, tight, slightly argillaceous with anhydrite	35	3160
Salina:		
Salt	70	3230
Dolomite, gray, very finely crystalline, slight porosity due to salt dissolving	25	3255
Salt	50	3305
Dolomite, tan, finely crystalline, with salt and anhydrite	60	3365
Salt	30	3395
Dolomite, tan, finely crystalline, with salt and anhydrite	40	3435
Salt	95	3530
Dolomite, gray to tan, very finely crystalline, tight, with anhydrite	110	3640
Salt	50	3690
Dolomite, gray to tan, finely crystalline, tight, with anhydrite, argillaceous	110	3800
Salt	45	3845
Salt, dolomitic	45	3890
Salt	60	3950
Salt, dolomitic	70	4020
Salt	78	4098
Dolomite, brown, finely crystalline, faint porosity in part	52	4150
Limestone, gray to dark gray, very finely crystalline, tight, lightly dolomitic	135	4285
Dolomite, tan, finely crystalline, tight, with anhydrite	20	4305
Salt	250	4555

Page 7 - Handy Twp. (Livingston County)
Panhandle Eastern Pipe Line Co.
E. C. Addison #1

	Thickness (Feet)	Depth (Feet)
Dolomite, dark brown to black, finely crystalline, tight, with anhydrite at top	67	4622
Anhydrite, gray dolomitic	10	4632
Dolomite, light gray to gray, very finely crystalline to finely crystalline, tight with anhydrite	18	4650
NIAGARAN:		
Guelph:		
Dolomite, light gray to white, finely crystalline, tight	120	4770
Clinton:		
Shale, gray to gray green with some maroon shale, dolomitic	45	4815
Dolomite, gray, medium crystalline, tight, slightly argillaceous	21	4846

Casing Record:

16"	106' 8"	Commenced:	9-27-44
10"	2958'	Completed:	5-29-45
8¼"	3160' RH	Initial Production:	Dry Hole.

Note: The Michigan section in this log was originally correlated with the Saginaw. This has been changed to the Michigan formation for two reasons, First, a brown dolomite is more characteristic of the Michigan than of the Saginaw. Second, the isopachous interval from the top of the Sunbury to the top of the Marshall in the Arthur F. Etienne, J. J. Eisner # 1, is 1235 feet, overlain by a brown dolomite; if this same interval is subtracted from the depth to the top of the Sunbury, 1343 feet in this well, one obtains a figure of 108 feet. At this depth a grey brown dolomite is found.

Genoa Twp. (Livingston County)

Panhandle Eastern Pipe Line Company
Gerald Bauer #1 Permit #11818
Drilling Contractor: I. C. Chamness

Location: C W½ NW¼ NW¼ section 25, T.2N., R.5E.
660' from north and 330' from west line of section

Elevation: 967.5 feet above sea level

Record by: Panhandle Eastern Pipe Line Company from samples

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
No samples	165	165
MISSISSIPPIAN:		
Coldwater:		
Sand, light tan to gray, well cemented, dolomitic, micaceous from 165-75	58	223
Sunbury:		
Shale, dark brown to gray; flaky to soft and sticky	12	235
Berea:		
Sand, medium fine light tan tight, slightly porosity and oil stain at 250 (show of gas 256-64)	85	320
Sand, as above to whiter	35	355
Bedford:		
Shale, gray, silty, sandy	85(75)	440(430)
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, brown, flaky	120	550
Shale, gray and brown	30	580
Shale, brown, limy	41(38)	621(618)
DEVONIAN:		
Traverse:		
Lime, tan to brown, granular, crystalline	6(9)	627
Chert, white to tan, slightly speckled (Hole full of water 625-30')	11	638
Shale, gray to light blue-gray, silty	14	652
Lime, light gray to tan, granular, shaly, slightly cherty	18	670

Page 2 - Genoa Twp. (Livingston County)
Panhandle Eastern Pipe Line Co.
Gerald Bauer #1

	Thickness (Feet)	Depth (Feet)
Lime, as above, darker gray to blue-gray and less granular	25	695
Lime, light tan, coarsely crystalline, cherty with crystalline porosity (2 bailers water/hour 695-702)	40	735
Lime, gray, silty, granular, fossiliferous	15	750
Lime, as above, to nodular, coarsely crystalline, cherty	40	790
Lime, silty, fossiliferous, bryozoa and crinoids	25	815
Lime, as above, but less silty	25	840
Lime, as above, to cherty	50	890
Lime, gray, fairly crystalline	17	907
Bell:		
Shale, and gray, shaly lime	47	954
Dundee:		
Lime, tan, crystalline, silty and granular	10	964
Lime, tan, finely crystalline, slightly dolomitic (Odor of oil 764-1002')	21	985
Lime, tan to buff, pyritic, some vugular porosity (Rainbow show of oil and gas 1002-15; would burn in top of bailer)	30	1015
Lime, as above, to more dolomitic and sucrosic (Odor of oil and gas 1015-35)	5	1020
Lime, as above, in the many stylolitic patterns in sample	33	1053
Lime, tan, crystalline with possible slight porosity; appears sandy	17	1070
Lime, as above to more finely crystalline	10	1080
Lime, as above with tan chert	9	1089
Lime, as above with chert and fine sand grains (100' water at 1094')	6	1095
Lime, tan, coarsely crystalline (400' water at 1110'; 560' water at 1114'; black water at 1135')	30	1125
Lime, gray, sucrosic and dolomitic; few vugs and cavities	16	1141
Detroit River:		
Dolomite, dull gray, finely sucrosic, limy	10	1151
Dolomite, white and tan, opaque, cherty, slight porosity	30	1181

Page 3 - Genoa Twp. (Livingston County)
Panhandle Eastern Pipe Line Co.
Gerald Bauer #1

	Thickness (Feet)	Depth (Feet)
Dolomite, tan, finely sucrose, with white, granular anhydrite	14	1195
Dolomite, as above, lighter in color, granular, vugular	25	1220
Dolomite, light tan, sugary with abundant white gypsum	35	1255
Dolomite, as above	20	1275
Gypsum, and dolomitic anhydrite	10	1285
Dolomite, gray (1 bailer water per hour at 1355-64)	80	1365
Dolomite, tan, sugary; some porosity	15	1380
Dolomite, finely sucrosic, and anhydrite	45	1425
Dolomite, finely sucrosic, and anhydrous dolomite; some pure anhydrite	60	1485
Dolomite, drab gray to tan	22	1507
Sylvania:		
Dolomite, tan, finely crystalline with large, rounded and medium, angular, transparent sand grains (Show of water at 1507')	37	1544
Sand, frosted and translusoent, medium coarse; coherent	16	1560
Sand, as above, free	25	1585
Dolomite, tan, finely sucrose, sandy (800' water at 1600')	15	1600
Sand, gray, medium coarse, angular	25	1625
Sand, grades lighter in color and more angular	65	1690
Sand, as above, to more glassy	10	1700
Sand, fine white to light gray, angular	15	1715
Sand, coarser and well cemented	10	1725
Sand, light gray to white, sub-angular, well sorted	40	1765
Sand, more poorly sorted and better cemented than above	10	1775
Sand, poorly sorted, free to sub-angular	35	1810
Sand, glassy, with white, opaque and translusoent chert	21	1831
Sand, gray, sub-angular, well-cemented, poorly sorted	19	1850
Sand, fine, well sorted, sub-angular	8	1858
Sand, fine, well cemented, glassy	7	1865

Page 4 - Genoa Twp. (Livingston County)
Panhandle Eastern Pipe Line Company
Gerald Bauer #1

	Thickness (Feet)	Depth (Feet)
SILURIAN:		
Bass Island:		
Chert, gray, dolomitic and shaly	5	1870
Chert, lithographic to finely granular, gray	25	1895
Chert, as above with some gray, finely sucrose dolomite	25	1920
Dolomite, cream to gray, finely sucrose with traces of chert (Sucrose and vugular at 1940-50) (1 Bailer water per hour at 1941-66)	30	1950
Dolomite, cream to tan, very finely crystalline to finely sucrosic with few vugules	35	1985
Dolomite, more gray and dull than above	35	2020
Dolomite, gray to tan, finely crystalline to finely sucrose	40	2060
Dolomite, gray, muddy, not so sugary	10	2070
Dolomite, cream to tan as above	25	2095
Dolomite, tan, with vugules filled with brown, crystalline dolomite (gilsonite?)	35	2130
Dolomite, cream to tan, finely crystalline to finely sucrose	22	2152
Dolomite, as above with some free gypsum	43	2195
Dolomite, tan to gray with trace of chert	20	2215
Dolomite, light tan to gray, finely crystalline to finely sucrose, trace of gypsum	15	2230
Dolomite, gray to tan, argillaceous, with anhydrite, grades lighter in color and more anhydrous	25	2255
Dolomite, gray, argillaceous with abundant white anhydrite	45	2300
Dolomite, gray, anhydrous	40	2340
Dolomite, as above to tan, finely pyritic at top and brown dolomite filling vugules at base	20	2360
Dolomite, tan, sugary	10	2370
Anhydrite, gray, shaly (At 2395' hole from 1914 to 2395 was making 1½ bailers of water per hour)	15	2385

Page 5 - Genoa Twp. (Livingston County)
Panhandle Eastern Pipe Line Co.
Gerald Bauer # 1

	Thickness (Feet)	Depth (Feet)
Salina:		
Salt	60	2445
Dolomite, gray, finely crystalline	10	2455
Dolomite, gray, muddy, with some red and green dolomite	65	2520
Salt	70	2590
Dolomite	25	2615
Salt	80	2695
Dolomite, gray, with salt	10	2705
Salt	80	2785
Dolomite, buff, finely crystalline, slightly vugular	20	2805
Salt	65	2870
Dolomite, light tan, finely sucrose, soft	20	2890
Dolomite, softer than above and lighter in color, possibly anhydrous	10	2900
Salt	85	2985
Dolomite, gray to tan, finely crystalline, few vugules at top	110	3095
Dolomite, as above with salt	45	3140
Dolomite, gray to tan, very finely crystalline, soft and sugary	110	3250
Salt	20	3270
Dolomite, with salt	80	3350
Salt	220	3570
Dolomite, tan	10	3580
Dolomite, gray, sugary (At 3585' water, had exhausted to 1 bailer per hour from open hole 1914-3585'; Odor oil 3585-3635; Strong odor gas 3609-26')	55	3635
Dolomite, gray-tan, finely crystalline to sub-sucrose	30	3665
Dolomite, light brown, sub-crystalline	35	3700
Dolomite, finely sucrosic as above and finely pyritic at 3700'; also lighter in color at that point	100	3800
Salt	113	3913
Dolomite, brown to dark brown, finely crystalline	7	3920
Dolomite, brown, sugary, grades lighter in color, duller in luster and softer (Strong odor of oil 3953-89')	60	3980
Anhydrite, and above dolomite	9	3989

Page 6 - Genoa Twp. (Livingston County)
Panhandle Eastern Pipe Line Co.
Gerald Bauer # 1

	Thickness (Feet)	Depth (Feet)
Dolomite, finely crystalline, sugary, some pyrite and possibly gilsonite (Dead oil stain)	48	4037
NIAGARAN:		
Guelph:		
Dolomite, dull light tan to blue-gray, crystalline with few weathered, disconnected vugules	11	4048
Dolomite, gray to blue-gray, massive to finely crystalline	9	4057
Dolomite, as above with chert and pyrite	8	4065
Dolomite, lighter in color, softer and more sucrosic	15	4080
Dolomite, blue-gray, crystalline to coarsely crystalline	50	4130
Dolomite, blue-gray, sucrosic to crystalline, vugular and pyritic	38	4168
Clinton:		
Shale, blue-gray, limy	17	4185
Shale, maroon, with some crystalline dolomite	29	4214

Casing Record:
16" 175'
13" 671'
10" 1228'
8¼" 1914'

Drilling Commenced: 9-22-45
Drilling Completed: 11-23-45

Superior Twp. (Washtenaw County)

Colvin & Associates & Rotary Electric Steel
Viola Meinzinger #1 Permit #11341
Drilling Contractor: Company tools (Cable)

Location: SE¼ NE¼ NW¼ section 12, T.2S., R.7E.
990' from north and 330' from east line of quarter section

Elevation: 818.3 feet above sea level.

Record by: D. Myers from driller's log and Lloyd B. Underwood of U. S. Geological from samples

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Gravel, clay, boulders and sand	210	210
MISSISSIPPIAN:		
Sunbury:		
Shale, black, fine, non-calcareous, a little pyrite minutely micaceous	14	224
Dolomite, pale green, soft, argillaceous	1	225
Berea:		
Sandstone, light gray fine grained angular fragments loosely cemented with dolomite and silica, a little pyrite, glauconitic and micaceous with the biotite mica giving the whole mass a speckled appearance (described by some as the salt and pepper sandstone). The individual quartz grains are angular to sub-angular frosted and pitted. (Hole full water 225)	31	256
Sandstone, light gray, loosely cemented to friable micaceous and pyritic. Individual sand grains angular to sub-angular	13	269
Sandstone, light gray, fine grained angular fragments loosely cemented with dolomite and silica. Micaceous and pyritic. Sand grains angular to sub-angular	6	275
No sample	5	280
Shale, gray, sandy, micaceous	4	284

Page 2 - Superior Twp. (Washtenaw County)
Colvin & Associates & Rotary Electric Steel
viola Meinzinger #1

	Thickness (Feet)	Depth (Feet)
Sandstone, light gray, very fine grained angular fragments tightly cemented with dolomite and silica. Micaceous and pyritic	19	303
No sample	11	314
Sandstone, light gray, very fine grained angular fragments tightly cemented with dolomite and silica. Micaceous, pyritic	21	335
No sample	1	336
Sandstone, light gray, very fine grained angular fragments. Tightly cemented with dolomite and silica. Micaceous and pyritic	17	353
Bedford:		
Shale, gray minutely micaceous, non-calcareous firm	20	373
No sample	2	373
Shale, gray, firm, non-calcareous and minutely micaceous	45	420
Shale, gray, firm, with sandstone light gray very fine grained angular fragments tightly cemented with dolomite and silica	17	437
Shale, gray, firm, non-calcareous, minutely micaceous	15	452
DEVONIAN:		
Antrim:		
Shale, black, firm, non-calcareous with a few scattered brown spore cases	66	518
No sample	7	525
Shale as above	17	542
No sample	2	544
Shale as above	39	583
Traverse:		
Dolomite, light gray sandy, pyrite and shale gray, slightly calcareous and fossiliferous	14	597
Shale, gray, slightly calcareous, pyrite and sandy dolomite	13	610
No sample	6	616
Shale, gray, slightly calcareous, pyrite and sandy dolomite	5	621
Traverse Lime:		
Dolomite, light gray, finely crystalline, pyritic with an abundance of white chert	41	662

Page 3 - Superior Twp. (Washtenaw County)
Colvin & Associates & Rotary Electric Steel
Viola Meinzinger # 1

	Thickness (Feet)	Depth (Feet)
Limestone, light gray to white, pyritic	14	676
Mud, light gray, calcareous	13	689
Limestone, light gray-gray brown, pyritic, fossiliferous a little gray shale	11	700
No sample	5	705
Limestone, gray, dense, pyritic	10	715
No sample	5	720
Mud, light gray, calcareous	18	738
Limestone, gray, dense, pyritic, fossiliferous	29	767
Limestone, gray to dark gray, shaly, very pyritic with abundance of ostracods and crinoid stems	13	780
No sample	4	784
Limestone, gray to dark gray, shaly, very fossiliferous with an abundance of pyrite	13	797
Limestone, light gray, dolomitic, a little pyrite	10	807
No sample	1	808
Dundee:		
No sample	4	812
Limestone, pale buff, fragmental, with bituminous matter deposited on the faces of some of the fragments, faces which were probably inner stylolitic faces. Very few spore cases (300' black water in 48 hours - 865)	66	878
Limestone, buff to light brown, granular to finely crystalline	26	904
Limestone, buff, dense, finely crystalline dolomite in part, a little chert, Pulverized from 920-30'	26	930
Detroit River:		
Dolomite, light brown, dense, finely crystalline; anhydrite, white to gray white	8	938
Dolomite, buff, dense, a little anhydrite	21	959
No sample	4	963
Dolomite, buff, dense, a little anhydrite	24	987
Dolomite, brown, dense, a little anhydrite (show gas 998)	30	1017
Dolomite, brown, dense, with anhydrite and some very thin layers of dark to light gray banded dolomite	15	1032

Page 4 - Superior Twp., (Washtenaw County)
Colvin & Associates & Rotary Electric Steel
Viola Meinzinger # 1

	Thickness (Feet)	Depth (Feet)
Dolomite, buff, dense, very finely crystalline, few scattered pieces of anhydrite	84	1116
Dolomite, brown, dense	8	1124
Dolomite, buff, sandy, and finely crystalline	16	1140
Dolomite, light brown to buff, very fine grained speckled with larger crystals of dolomite	30	1170
Sylvania:		
Sandstone, white, sub-angular to sub-rounded sub-hedral in part, frosted and pitted, a few grains show iron oxide staining	95	1265
No sample	3	1268
Sandstone, gray white, sub-angular to sub-rounded sub-hedral in part, frosted and pitted. Some gray dolomite and little pyrite	37	1305
Sandstone, white, sub-angular to sub-rounded sub-hedral in part, frosted and pitted	65	1370
Onondaga:		
Dolomite, gray, very fine grained to dense, an abundance of chert	10	1380
Dolomite, gray-brown, dense, a little chert	12	1392
Dolomite, gray, very fine grained to dense, a little chert	13	1405
SILURIAN:		
Bass Island:		
Dolomite, gray to gray brown, dense, tight and very fine grained, a little anhydrite	68	1473
Dolomite, gray brown, dense	12	1485
No sample	4	1487
Dolomite, gray brown, dense very fine grained a little anhydrite	40	1527
Dolomite, buff, very finely crystalline	6	1533
Dolomite, gray-brown, dense, very fine grained, a little anhydrite	20	1553
Dolomite, gray, argillaceous, tight, a little anhydrite	31	1584
Dolomite, light gray-brown, very finely crystalline to dense	33	1617

Page 5 - Superior Twp. (Washtenaw County)
Colvin & Associates & Rotary Electric Steel
Viola Meinzinger # 1

	Thickness (Feet)	Depth (Feet)
Dolomite, dark gray-brown, argillaceous dense, tight with abundance of anhydrite	13	1630
Dolomite, light gray, argillaceous to shaly, tight	16	1646
Salina:		
Dolomite, light gray, some red fragments, argillaceous very firmly crystalline a little anhydrite	14	1660
Dolomite, gray to light brown, a very finely crystalline to dense, a little anhydrite	40	1700
Salt, with a little gray argillaceous dolomite at 1720	65	1765
Dolomite, gray-brown argillaceous, tight	19	1784
Salt	52	1836
Dolomite, gray-brown, dense, a little salt	44	1880
Salt	9	1889
Dolomite, gray-brown, dense, tight	11	1900
Salt	26	1926
Dolomite, gray-brown, dense, a little anhydrite	31	1957
Salt	39	1996
Dolomite, gray, brown, dense	2	1998
Salt	52	2050
Dolomite, gray, shaly, with a little anhydrite	26	2076
Dolomite, light brown, dense, tight	15	2091
Dolomite, buff to dark brown, dense, some argillaceous dolomite, a little anhydrite, chert and pyrite; a little salt at 2155', sample shows evidence of having more salt which was probably washed away in drilling	91	2182
Salt	16	2198
Dolomite, gray, sugary, argillaceous to shaly, somewhat gritty in part	70	2268
Dolomite, brown, finely crystalline, a little anhydrite	12	2280
Dolomite, gray, argillaceous, anhydrous	10	2290
Salt	30	2320
Dolomite, gray-brown, finely crystalline to dense	11	2331
Salt	18	2349
Dolomite, gray-brown, dense	15	2364
Salt	104	2468

Page 6 - Superior Twp. (Washtenaw County)
Colvin & Associates & Rotary Electric Steel
Viola Meinzinger # 1

	Thickness (Feet)	Depth (Feet)
Dolomite, gray-brown, dense	12	2480
Salt	82	2562
Dolomite, brown, finely crystalline to dense	24	2586
Limestone, brown, finely crystalline to dense, dolomite	40	2626
Limestone, gray brown, dense, argillaceous	40	2666
Limestone, dark brown-black, dense, tight, shaly	72	2738
Shale, gray, hard, calcareous	11	2749
Limestone, dark brown, finely crystalline to dense, a little anhydrite, shaly	11	2760
Limestone, gray-brown to buff, finely crystalline, dolomitic	18	2778
Dolomite, buff, finely crystalline to dense with anhydrite	12	2790
Salt	10	2800
Limestone, buff, dense	6	2806
Dolomite, brown, finely crystalline to dense	46	2852
Dolomite, dark brown	6	2858
Dolomite, brown, finely crystalline to dense	6	2864
Dolomite, dark brown, finely crystalline to dense	15	2879
Dolomite, light brown to buff, finely crystalline to dense	81	2960
Niagaran:		
Lockport:		
Dolomite, buff, dense, a little chert, white	24	2984
Dolomite, white to buff, finely crystalline	73	3057
Clinton:		
Rochester (?)		
Dolomite, light gray, dense	8	3065
Shale, gray, dolomite, gray-brown, dense, argillaceous	8	3073
Dolomite, buff to gray, dense, a little shale, a little pyrite. Some fragments of red, crystalline dolomite	17	3090
Alexandrian:		
Cataract:		
Cabot Head:		
Shale, red, dolomite, buff to red,		

Page 7 - Superior Twp. (Washtenaw County)
Colvin & Associates & Rotary Electric Steel
Viola Meinzinger # 1

	Thickness (Feet)	Depth (Feet)
crystalline, a few scattered fragments of green shale	25	3115
Dolomite, buff to grey, dense, some argillaceous dolomite and a little green shale	37	3152
Manitoulin:		
Dolomite, buff, dense, crystalline	12	3164
Dolomite, light gray, some argillaceous dolomite	11	3175
Dolomite, buff, dense, crystalline, limy	30	3205
ORDOVICIAN:		
Cincinnatian:		
Richmond? Lorraine:		
Shale, gray and maroon, non-calcareous	18	3223
Shale, gray, noncalcareous	14	3237
Shale, gray, calcareous	82	3319
Shale, maroon, (some gray), slightly calcareous	39	3358
Shale, gray to greenish-gray, layers of brown to buff limestone interbedded with the shale	177	3535
Shale, gray, very slightly calcareous	215	3750
Utica:		
Shale, dark gray to black, firm	48	3798
Mohaukian:		
Trenton:		
Dolomite, brown, finely crystalline to dense	4	3802
Limestone, brown to buff, dense, crystalline, dolomite	27	3829
Limestone, buff to brown, finely crystalline to dense	14	3843
Limestone, buff, dense (water 3850)	15	3858
Limestone, buff to brown, finely crystalline to dense, a few scattered fossil fragments	85	3943
Limestone, buff, crystalline, dense	16	3959
Limestone, buff to brown, dense, to finely crystalline, little dark gray, argillaceous limestone	105	4064
Limestone, dark brown, a little buff, finely crystalline to dense, a		

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Colvin & Associates & Rotary Electric Steel
Viola Meinzinger # 1

	Thickness (Feet)	Depth (Feet)
small amount of dark gray argillaceous limestone	106	4170
Limestone, dark brown to black, crystalline and dense, a little black calcareous shale	65	4235
Black River:		
Limestone, buff to brown, dense, a little gray shale	18	4253
Limestone, buff to gray brown, dense and crystalline	129	4382
Limestone, gray brown, dense, some gray argillaceous limestone	118	4500
Limestone, dark brown, dense	26	4526
Limestone, dark gray brown, dense, argillaceous in part	159	4685
Limestone, dark brown, dense, slightly dolomitic	11	4696
Cambrian:		
Trempealeau:		
Dolomite, buff, finely crystalline to dense, glauconitic and pyritic	34	4730
Dolomite, buff and dark brown, finely crystalline and dense, trace of chert (1 bailer water/hr. 4760)	31	4761
Dolomite, dark brown, dense	6	4767
Dolomite, buff, finely crystalline to dense	100	4867
Dolomite, gray, finely crystalline to dense	51	4918
Dolomite, tan, finely crystalline to dense	17	4935
Dolomite, gray brown, finely crystalline to dense	18	4953
Dolomite, gray to dark gray, dense	28	4981
Dolomite, light brown, dense to crystalline	4	4985
Dolomite, gray to dark gray, buff and brown, finely crystalline to dense	74	5059
Dolomite, grayish brown, finely crystalline, some micaceous sandstone (Preliminary Report St. Lawrence 5059)	15	5074
Franconia:		
Sandstone, gray, fine to very fine grained, glauconitic, dolomite, gray, dense	12	5086

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Colvin & Associates & Rotary Electric Steel
viola Meinzinger # 1

	Thickness (Feet)	Depth (Feet)
Dresback:		
Sandstone, pink, fine grained, angular, friable, clean (hole full water 5086)	12	5098
Sandstone, tan, very fine, friable	9	5107
Sandstone, light rusty brown, fine to very fine grained friable	18	5125
Sandstone, dark reddish brown, very fine grained, friable	10	5135
Sandstone, pale pink, very fine grained, friable	29	5164
Sandstone, buff, very fine grained, friable	11	5175
Eau Claire:		
Sandstone, gray to dark grayish brown, very fine grained, friable to partially cemented with dolomite	21	5196
Sandstone, gray-brown, unsorted, dolomitic and silty	25	5221
Sandstone, red, very fine grained, friable, dolomitic (puff gas 5230)	10	5231
Sandstone, somewhat fine grained, friable	3	5234
Sandstone, pink, fine grained, friable (Hole full water in 12 hours -5240)	14	5248
Sandstone, brown, fine grained, rusty; dolomite, brown, dense	43	5291
Sandstone, white, fine grained, friable, trace of dolomite	6	5297
Sandstone, red brown, medium grained, friable, rusty and a little dolomite	4	5301
Sandstone, white, buff, fine grained, rusty, trace of dolomite	40	5341
Sandstone, gray brown, medium grained, rusty, a little dolomite, brown	7	5348
Mt. Simon:		
Sandstone, white, fine grained, friable	19	5367
Sandstone, white, fine to medium, grained, friable	228	5595
Sandstone, pink, light brown, fine, medium and coarse grained, friable	36	5631
Sandstone, pink to light brown, fine, medium and coarse grained, friable, some fragments of igneous rocks	39	5670
Pre Cambrian (Granite):		
Quartz, feldspar, biotite, garnet, etc. very angular (some rounded grains and fragments are found in the cuttings. These grains		

Page 10 - Superior Twp. (Washtenaw County)
Colvin & Associated & Rotary Electric Steel
Viola Meinzinger # 1

	Thickness (Feet)	Depth (Feet)
were probably accumulated in pockets or joints in ended pre Cambrian surface) Small particles of tar residue were present in the cuttings from 5631-37' and 5650-56'	22	5692

Casing record:
16" 200'
14" 812'
10" 1560'
8¼" 3830'

Commenced: 2-25-45
Completed: 7-28-45
Initial Production: Dry Hole

Argentine Twp. (Genesee County)

Rowmor Corporation
George Gillespie #1 Permit # 2828
Drilling Contractor: Brick Carr

Location: SW¼ SW¼ SW¼ of section 3, T.5N., R.5E.
330 feet from south and 330 feet from west line of quarter section

Elevation: 832.6 feet above sea level

Record by: Kenneth Gorton from driller's log and samples

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Drift	193	193
PENNSYLVANIAN:		
Saginaw-Parma:		
Shale, black	32	225
Shale, dark gray	10	235
Sandstone, gray, shaly, fine, cemented	10	245
Sandstone, gray, medium, clear, angular	15	260
Sandstone, gray, coarse, clear, angular	5	265
Sandstone, gray, fine, cemented, shaly	20	285
Shale, gray, hard, sandy	10	295
Shale, gray, soft	5	300
Sandstone, gray, with white quartz pebbles; some shale	5	305
Shale, black	20	325
Sandstone, gray; gray and black shale	10	335
MISSISSIPPIAN:		
Coldwater:		
Sandstone, gray, fine, cemented	15	350
Shale, gray, hard, sandy, mica; a little brown dolomite	90	440
Shale, gray, soft, sandy	10	450
Shale, gray	10	460
Shale, gray, hard, sandy, mica	80	540
Shale, gray, soft	30	570
Shale, gray, sandy	20	590
Sandstone, shaly, gray, fine, mica, cemented	90	680
Shale, sandy, gray, hard	30	710
Sandstone, shaly, gray, fine, mica cemented; gray shale	140	850
Shale, sandy, gray, hard; fine sandstone	30	880
Sandstone, shaly, cemented, mica; hard gray shale	220	1100
Shale, gray; fine gray shaly sandstone	20	1120

Page 2 - Argentine Twp. (Genesee County)
Rowmor Corporation - Geroge Gillespie # 1

	Thickness (Feet)	Depth (Feet)
Sandstone, shaly, gray, fine cemented; gray shale	80	1200
Shale, gray	20	1220
Sunbury:		
Shale, black	10	1230
Shale, black; some fine gray, cemented sandstone	6	1236
Berea:		
Sandstone, gray, fine, cemented, pyrite	15	1251
Same with gray shale	5	1256
Sandstone, gray, fine, cemented, mica (1st wtr 1268)	44	1300
Sandstone, gray, fine, loosely cemented, mica (HFW 1305-25)	20	1320
Same, cemented	20	1340
Bedford:		
Shale, gray, soft	10	1350
Shale, gray, hard	10	1360
Shale, gray, soft	10	1370
Shale, gray, hard, sandy	10	1380
Shale, gray	50	1430
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, black	90	1520
Shale, black, pyrite	50	1570
Shale, black and gray	20	1590
Shale, gray, hard, dolomitic, pyrite	10	1600
Shale, black; and black, finely crystalline dolomite	28	1628
DEVONIAN:		
Traverse:		
Dolomite, brown, vitreous; and gray shale	10	1638
Shale, gray	22	1660
Dolomite, brownish-gray; and gray chert	25	1685
Limestone, gray, shaly, fossils	10	1695
Limestone, brownish-gray; a little chert	5	1700
Limestone, gray, shaly	15	1715
Limestone, brownish-gray; a little chert	10	1725
Dolomite, light brown, crystalline; a little chert	15	1740
Limestone, brownish-gray	5	1745
Dolomite, light brown, crystalline; gray limestone	5	1750
Limestone, gray and brown	5	1755
Limestone, gray	10	1765

Page 3 - Argentine Twp. (Genesee County)
Rowmor Corporation - George Gillespie #1

	Thickness (Feet)	Depth (Feet)
Limestone, brownish gray	30	1795
Limestone, gray and brown; some chert	5	1800
Chert, gray, and brown limestone	5	1805
Shale, gray	10	1815
Limestone, brownish gray	15	1830
Shale, gray; and brownish-gray limestone	10	1840
Shale, gray	20	1860
Shale, dark gray, limy, fossils	25	1885
Limestone, gray, shaly, fossils	20	1905
Shale, gray	35	1940
Limestone, shaly, dark gray, fossils	50	1990
Shale, dark gray	30	2020
Shale, dark gray, limy, fossils	14	2034
Dundee:		
Limestone, light brown, finely crystalline; gray shale cavings(?)	16	2050
Limestone, buff, finely crystalline; gray shale cavings	32	2082
Limestone, buff, finely crystalline	41	2123
Limestone, buff, finely crystalline, and some light brown, finely crystalline, sugary dolomite	8	2131
Limestone, buff, finely crystalline; little or no dolomite (black water 2135)	27	2158
Limestone, buff, finely crystalline; a little gray shale cavings (?) (show gas and HF black wtr 2158-64)	6	2164
No sample	6	2170

Casing record:
10" 193'
8¼" 550'
6-5/8" 1348'
5" 2022' R.H.

Commenced: 10- ?-35
Completed: 12-21-35
Initial Production: Dry hole
Plugged and abandoned: 1-14-36

Gaines (Genesee County)

Lewis Burr

A. C. Hermann #1 Permit # 7275

Drilling Contractor: C. C. Cogan

Location: SW¼ SW¼ NW¼ section 13, T. 6N., R.5E. 330' from south and 400' from west line of quarter section

Elevation: 796.6 feet above sea level.

Record by: L. Hale from samples 180-2473.

	Thickness (Feet)	Depth (Feet)
No record	180	180
MISSISSIPPIAN:		
Michigan(?):		
Shale, dark gray; well cemented sandstone; a little gypsum and dolomite	10	190
Shale, black, soft, flaky, micaceous	10	200
Shale, gray, micaceous, sandy, hard; and some brown hard dense shaly dolomite; a few coarse quartz particles	30	230
Shale, gray very micaceous; a few coarse quartz particles	10	240
Sandstone, gray, both friable and well cemented a little gray shale; a little hard brown shale	10	250
Marshall(?):		
Sandstone, white, coarse to fine grained, conglomeratic; a little gray, micaceous shale and dolomite	90	340
Sandstone, light gray, very fine to coarser grained-both friable and cemented with a shaly, muddy cement	35	375
Coldwater:		
No record	43	418
Mud, gray and a little shale; a little dolomite and sandstone	11	429
Shale, gray, flaky, micaceous; and gray sandy shale	6	435
Shale, gray, micaceous, flaky; a little muddy shale	20	455
Shale, gray, micaceous; a little sandy shale	82	537
Shale, light gray, sandy, micaceous; a little light brown, hard sandy shale	103	640

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Lewis Burr - A. C. Hermann #1

	Thickness (Feet)	Depth (Feet)
Shale, gray, flaky, micaceous; a little hard brown shale	74	714
Shale, light gray, very sandy and micaceous	61	775
Shale, light gray and dark gray, very sandy and micaceous	75	850
No record	10	860
Shale, light gray, very sandy and micaceous	55	915
Shale, light gray, sandy and micaceous	25	940
Shale, light gray & dark gray, sandy micaceous	32	972
Shale, gray, flaky, micaceous; and light gray very sandy micaceous shale	218	1190
Shale, gray, flaky; a little light gray, hard sandy shale; traces of dolomite	115	1305
Shale, light gray, very sandy, micaceous and gray and red flaky shale	7	1312
Shale, light gray, very sandy, micaceous, traces of gray shale	10	1322
Shale, gray, flaky	10	1332
Shale, gray, flaky, micaceous-with some organic matter; some light gray sandy micaceous shale	13	1345
Shale, red, soft, fissile; and some green and gray fissile shale	5	1350
Sunbury:		
Shale, gray fissile	10	1360
Shale, black, flaky; some gray dolomite; a little light shale with green colorations	5	1365
Shale, black, flaky	18	1383
Berea:		
Sandstone, gray, well cemented, pyritiferous; and black flaky shale	8	1391
Sandstone, gray, partially cemented; some gray micaceous shale; a little pyrite	24	1415
Sandstone, gray to light brown, fine grained-both friable and well cemented; traces of shale (Hole full water 1425)	43	1458
Sandstone, gray, well cemented; and gray flaky shale	20	1478
Bedford:		
Shale, gray and dark gray, slightly micaceous	7	1485

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Lewis Burr - A. C. Hermann # 1

	Thickness (Feet)	Depth (Feet)
Shale, light gray, hard, somewhat sandy and dolomitic; a little gray and brown shale	34	1519
Shale, gray, flaky, hard, micaceous	73	1592
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, black, hard; traces of gray shale	15	1607
Shale, black, with a few spores and a little pyrite	133	1740
Shale, dark gray, flaky; a little shaly dolomite	10	1750
Shale, black, hard; a little pyrite	44	1794
DEVONIAN:		
Traverse:		
Dolomite, light brown, dense to finely crystalline; and gray, flaky, slightly limy	12	1806
Shale, gray, flaky; a little dolomite	19	1825
Shale, gray, limy-both flaky and muddy	10	1835
Limestone, grayish-brown, dense; grayish-brown chert; some gray limy shale	5	1840
Limestone, light brown and buff, dense; buff chert; a little shale	7	1847
Limestone, light brown and buff, dense; brown crystalline dolomite; and some buff chert	13	1860
Limestone, grayish-brown, dense shaly	30	1890
Limestone, light brown, broken crystalline-drills up as fine grains; traces of gray shale	10	1900
Limestone, light brown, dense to broken crystalline; and some buff chert	10	1910
No record	10	1920
Limestone, grayish-brown to brown, dense, shaly; traces of gray shale	44	1964
Limestone, brown and light brown, dense	10	1974
Limestone, buff and light brown, dense; some gray flaky shale; a little chert	18	1992
Limestone, brown and light brown, dense	12	2004

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Lewis Burr - A. C. Hermann # 1

	Thickness (Feet)	Depth (Feet)
Limestone, gray, fossiliferous; a little gray flaky shale	62	2066
Shale, gray, limy	14	2080
Shale, and limestone, gray, fossiliferous	80	2160
Shale, gray, both flaky and muddy, limy	10	2170
Shale, gray, flaky, limy; a little limestone (Show gas at 2198)	30	2200
Dundee:		
Limestone, light brown and gray limy shale	10	2210
Limestone, light brown to buff, dense with occasional secondary crystallization traces of gray shale	48	2258
Limestone, light brown, dense to broken crystalline	27	2285
Limestone, light brown, dense to broken crystalline some brown limestone; traces of shale	5	2290
Limestone, buff, broken crystalline to dense; a little gray splintery shale	20	2310
Limestone, buff, dense; and buff and white crystals of calcite and dolomite	29	2339
Limestone, buff, dense with some secondary crystallization and a little gray shale	10	2349
No record (Hole full water at 2359)	22	2371
Limestone, buff-with some secondary crystallization	4	2375
Limestone, buff-with some secondary crystallization; and some gray shale	23	2398
No record	11	2427
Dolomite, light brown, finely crystalline, a little limestone and traces of dark shale	10	2437
Dolomite, brown to light brown, finely crystalline; some white chert; and some gray shale	11	2448
No record	7	2455
Dolomite, brown, dense to finely crystalline	8	2463
Dolomite, brown, finely crystalline	10	2473
No record	20	2493

Casing record:
10" 118'
8¼" 525'
6-5/8" 1501'

Commenced: 6-13-40
Completed: 8-2-40
Initial Production: Dry Hole

Burns Twp. (Shiawassee County)

E. C. Barlow

E. C. Barlow #1 Permit # 8968
Drilling Contractor: Stork Oil Company

Location: SE¼ SE¼ NE¼ section 4, T.5N., R.4E. 330' from south and 330' from east line of quarter section

Elevation: 827.2 feet above sea level.

Record by: L. Esch from driller's log and samples 165-2062

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Drift	126	126
PENNSYLVANIAN:		
Saginaw:		
Sand	4	130
Mud, black	35	165
Sandstone, gray, fine grained, micaceous, well cemented (some drift cavings)	5	170
Sandstone, gray, medium grained, angular to sub-angular, considerable pyrite; a little gray shale	10	180
Shale, gray, flaky, micaceous and mud	16	196
Shale, gray, flaky; some mud	5	201
Shale, gray-both flaky and muddy; a little hard very sandy shale	5	206
Shale, black, carbonaceous and gray mud	6	212
Shale, black, carbonaceous; a little hard brown shale (a few drift cavings)	13	225
Shale, black with pyrite partings; and mud	5	230
Shale, black carbonaceous and gray mud	7	237
Shale, black; some brown, hard shale; some muddy sandstone and some rounded brown and white sandstone pellets (probably remnant Marshall)	6	243
Coldwater:		
Shale, gray, flaky, micaceous and mud	14	257
Shale, gray, flaky, micaceous-and some brown sandy, micaceous - shale	16	273
Shale, gray - both flaky and muddy and occasional brown hard shale (Probably clay-ironstone concretions)	102	375
Shale, gray; gray and brown mud; a little brown hard shale	140	515
Sandstone, gray, very fine grained, shaly	15	530
No samples - driller's log - Shale and shells, light gray	20	550

Page 2 - Burns Twp. (Shiawassee County)
E. C. Barlow - E. C. Barlow #1

	Thickness (Feet)	Depth (Feet)
Shale, gray and light gray, very sandy shale	95	645
Shale, gray - both flaky and muddy	130	775
Shale, gray, both gray and brown, very sandy, hard; and gray flaky shale	275	1050
No samples-driller's log-shale and shells, light gray	30	1080
Shale, gray and red; a little sandy shale	10	1090
Shale, gray and brown, sandy, micaceous; and gray micaceous flaky shale	25	1115
Shale, gray - both flaky and muddy	14	1129
Sunbury:		
Shale, black	16	1145
Berea:		
Sandstone, light gray and light brown, micaceous, well cemented with a dolomitic cement; a little gray micaceous shale (1 bailer water/hour at 1216?)	110	1255
Bedford:		
Shale, gray, flaky	75	1330
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, black to brown, slightly micaceous; a little pyrite (small show gas & water at 1450)	175	1505
Shale, gray to black; a trace of limy shale	10	1515
Shale, black	12	1527
Shale, black; some light brown dense, dense to crystalline dolomite; a little pyrite (probably top of Traverse at 1535 as given in preliminary report)	23	1550
DEVONIAN:		
Traverse:		
Shale, gray, flaky, slightly limy	30	1580
Dolomite, light brown dense; light gray - brown chert; a trace of shale	10	1590
Limestone, brown, dense; some gray and brown chert; a trace of shale and dolomite (Hole full water at 1595)	10	1600
Limestone, gray-brown, dense, shaly	10	1610

Page 3 - Burns (Shiawassee County)
E. C. Barlow - E. C. Barlow #1

	Thickness (Feet)	Depth (Feet)
Limestone, brown, dense	10	1620
Limestone, light brown dense and buff, crystalline dolomite; a trace of chert	25	1645
Limestone, brown and gray-brown, dense; occasional fossils and a trace of shale	25	1670
Limestone, gray and gray-brown, shaly; a little shale; a few fossils	15	1685
Limestone, light brown, dense	15	1700
Limestone, light brown, dense; a little chert	12	1712
Dolomite, light brown, crystalline; and dense limestone	13	1725
Limestone, light brown - both dense and crystalline; a little dolomite; some gray shale	15	1740
Shale, gray, muddy; a little limestone	10	1750
Shale, gray, limy; and dense limestone; a few fossils	27	1777
Limestone, gray, shaly	14	1791
Shale and limestone, gray, fossiliferous	9	1800
Shale, gray-both flaky and muddy	22	1822
Limestone, light brown, dense; a trace of shale	15	1837
Shale, light gray-both flaky and muddy	53	1890
Shale and limestone, gray, fossiliferous	16	1906
Shale, light gray, both muddy and flaky	30	1936
Shale, gray, flaky and some limestone (really looks more like Traverse than Dundee)	8	1944
Dundee:		
Limestone, dark gray-brown, both dense to very finely crystalline; a few fossils	4	1948
Limestone, dark gray-brown, and gray shale	6	1954
Limestone, brown and buff, dense	6	1960
Limestone, buff, dense-some broken crystalline limestone; trace of shale and pyrite	25	1985
Limestone, buff, dense with some secondary calcite; a trace of shale	10	1995
Limestone, buff, dense to broken crystalline	13	2008
Limestone, buff, dense to finely crystalline-showing a little stylolitic activity	32	2040
Limestone, light brown, dense to broken crystalline with a few quartz grains	10	2050
Limestone, buff, broken crystalline; a few quartz grains; a little gray shale	12	2062

Page 4 - Burns (Shiawassee County)
E. C. Barlow - E. C. Barlow # 1

	Thickness (Feet)	Depth (Feet)
No further samples		
Lime, light (2000' black water at 2066)	4	2066
Lime, hard (Monroe, hard?)(Hole full black water at 2165)	115	2181

Casing Record:
10" 126'
8¼" 500'
6 5/8" 1290'
5 3/16" 2135'

Commenced: 10-1-41
Completed: 12-30-41
Initial Production: Dry Hole

Locke Twp. (Ingham County)

Hilmur Oil Company

Potter #1 Permit #792

Location: NE¼ NW¼ NW¼ of section 21, T.4N.,R.2E. 300 feet from north and 1300 feet from west line of quarter section.

Elevation: 915.3 feet above sea level

Record by: O. F. Poindexter from samples.

	Thickness (Feet)	Depth (Feet)
No record	110	110
PENNSYLVANIAN:		
Saginaw:		
Blue gray shale and black coaly shale and fire clay	5	115
Gray and black sandy shale and fire clay	5	120
Dark grayish brown shale	5	125
Gray shaly sandstone and dark gray shale	15	140
Dark gray sandy shale, gray sandstone, coal and cavings from drift	10	150
Blue gray sandy shale, shaly sandstone and fire clay	62	212
White sandstone	8	220
No record	25	245
White sandstone	38	283
Black shale white and cavings	14	297
Black shale	5	302
Gray sandy shale	4	306
Gray sandstone and black shale	4	310
Gray sandy shale and shaly sandstone	22	332
Fine grained white sandstone with considerable pyrite	7	339
Fine gray sandstone and coal	35	374
Black shale	16	390
Black shale and gray sandstone	26	416
Gray shale	5	421
Parma:		
White sandstone with black and gray shale cavings	59	480
White sandstone with considerable pyrite	29	509
White sandstone with some buff dolomite	17	526
White sandstone (little or no dolomite)	7	533

Page 2 - Locke Twp. (Ingham County
Hilmur Oil Co. - Potter # 1

	Thickness (Feet)	Depth (Feet)
MISSISSIPPIAN:		
Bayport:		
Buff dolomitic limestone and white sandstone cavings	35	568
Buff dolomitic limestone, black shale, gypsum and cavings	5	573
Michigan:		
Buff dolomite gypsum and anhydrite	19	592
Blue gray sandy shale	10	602
Blue gray shale with gypsum	13	615
Gypsum, anhydrite, and blue gray shale	16	631
Blue gray shale and gypsum	29	660
Gray shale and gray to brown dolomite	52	712
Blue gray sandy shale	10	722
Gray sandy shale and red sandstone	18	740
Gray sandy shale, slightly calcareous	10	750
Dark gray sandy shale and gray shaly sandstone	10	760
Napoleon:		
Gray sandstone with shale and dolomite cavings	10	770
White and gray sandstone	21	791
Reddish sandstone	24	815
Lower Marshall:		
Red sandy shale	12	827
Red sandstone	26	853
Red shale	10	863
No record	10	873
Blue gray shale	27	900
Red sandy shale	31	931
Sand and shaly limestone	10	941
Blue gray shale	10	951
Fine grained red sandstone, very micaceous (drills up in chunks)	12	963
No record	20	983
Gray shale	8	991
Gray shale	151	1142
Red shale	19	1161
Coldwater:		
Gray shale and cavings from Marshall (red sandstone, etc.)	16	1177
Gray shale with some cavings	13	1190
No record	17	1207
Blue gray shale with cavings from coal measures	5	1212
Blue shale	7	1219
No record	5	1224
Chiefly drift material with blue shale (may be accidental mixture)	4	1228

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Hilmur Oil Company - Potter # 1

	Thickness (Feet)	Depth (Feet)
No record	62	1290
Blue shale with reddish discoloration and drift material	20	1310
Gray and dark gray shale with some red shale	14	1324
Blue shale	9	1333
Dark gray shale and blue gray sandy shale	60	1393
Blue gray shale	18	1411
Blue gray and gray shale	31	1442
Blue gray and gray sandy shale	10	1452
Blue gray and gray shale	36	1488
Dark gray shale	37	1525
Blue sandy shale, dark gray shale and limestone	18	1543
Hard gray sandstone (drills in chunks)	16	1559
Gray shale and hard gray fine grained sandstone	81	1640
Dark gray to black shale and hard gray sandstone cavings	50	1690
No record	5	1695
Gray sandy shale and fine grained gray micaceous sandstone	235	1930
Sunbury-Berea (undivided):		
Dark gray shale	10	1940
Berea:		
Dark gray shale and hard gray micaceous sandstone	30	1970
Hard gray micaceous sandstone and dark gray shale	55	2025
No record	22	2047
Hard gray micaceous sandstone and gray shale	20	2067
DEVONIAN:		
Antrim:		
Black shale	163	2230
Black shale with gray and buff to brown dolomite and pyrite (concretion zone ?)	22	2252
Brown shale	13	2265
Black shale	26	2291
Black shale and brown dolomite (concretions ?)	5	2296
Black shale	13	2309
Black shale and brown dolomite	4	2313
Traverse:		
Gray shale and brown dolomite cavings	10	2323
Dark gray to black shale and gray shaly limestone	12	2335

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Hilmure Oil Company - Potter # 1

	Thickness (Feet)	Depth (Feet)
Gray cherty limestone, grayish buff limestone and black shale	56	2391
Light buff limestone	10	2401
Buff and grayish buff cherty limestone and black shale	26	2427
Light yellow buff cherty limestone	16	2443
Dark gray to black shale	2	2445
Grayish buff cherty limestone and black shale cavings	38	2483
Brownish buff very cherty limestone	6	2489
Grayish buff cherty limestone	7	2496
Grayish buff limestone	16	2512
Bell:		
Soft gray calcareous shale	8	2520
Dark gray shale, gray and grayish buff limestone	8	2528
Dark gray to black shale with cavings	15	2543
Soft gray shale	8	2551
Dark gray to black shale with buff limestone	22	2573
Soft gray shale	10	2583
Dark gray to black shale and buff limestone	12	2595
Dundee:		
Grayish buff limestone with shale cavings	18	2613
No sample (water 2619½ - 2625½)	12½	2625½

Completed: 2-8-30
Plugged and abandoned: 2-10-30

Highland (Oakland County)

Fisher - McCall Oil & Gas, Inc.
H. LeBel #1 Permit # 9262

Drilling Contractor: Company Tools

Location: NE¼ SE¼ SE¼ Section 18,T.3N., R.7E.
990 feet from south and 330 feet from east line of quarter section

Elevation: 1039.9 feet above sea level

Record by: L. Esch from drillers log and samples 350-1600

	Thickness (Feet)	Depth (Feet)
PLEISTOCENE:		
Drift:		
Drift	286	286
MISSISSIPPIAN:		
Coldwater:		
Shale, blue	46	332
Shale, gray and shells	18	350
Shale, light gray, sandy, micaceous, limy	30	380
Shale, light gray, muddy, soft, some flaky shale	20	400
Shale, gray and brown, micaceous	10	410
Shale, gray, micaceous, hard; and light gray sandy micaceous shale	20	430
Shale, light gray, very sandy, micaceous; limy; a little gray flaky shale	40	470
Shale, light and light brown, sandy and micaceous shale	70	580
Shale, gray, flaky; a little sandy shale	20	600
Shale, light gray-both flaky and muddy	30	630
Shale, light gray, sandy, hard, micaceous; and some gray, flaky shale	135	765
Sunbury:		
Shale, black; a little light gray, micaceous sandy shale	5	785
Berea:		
Shale, gray, micaceous; and light gray pyritic sandstone	5	790
Shale, gray-both flaky and muddy	20	810
Shale, gray, flaky, hard	10	820
Sandstone, gray, very fine grained micaceous and well cemented; some gray micaceous shale	36	856

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Fisher-McCall Oil & Gas, Inc.
H. LeBel # 1

	Thickness (Feet)	Depth (Feet)
Sandstone, light gray and light brown, fine grained, micaceous, very well cemented; a trace of gray flaky shale	69	925
Bedford:		
Shale, gray, flaky, hard; a little light gray, sandy micaceous shale	40	965
Dolomite, light gray, micaceous, dense; some gray shale	5	970
Shale, gray, flaky; a little dolomite	20	990
MISSISSIPPIAN-DEVONIAN:		
Antrim:		
Shale, dark gray to black; a few spores	145	1135
Shale, gray and dark gray; and some brown dolomite	5	1140
DEVONIAN:		
Traverse:		
Dolomite, brown, very finely crystalline; pyritic; a little dark shale	2	1142
Shale, gray, flaky	16	1158
Shale, gray, dolomitic	12	1170
Shale, gray, dolomitic; a little dolomite; a trace of chert	5	1175
Dolomite, light gray-brown, dense to crystalline and light brown, translucent chert	5	1180
No samples: drillers log - Lime, chert	5	1185
Limestone, brownish-gray, dense, shaly; trace of chert and fossils	15	1200
Shale, gray, limy; a little chert	8	1208
Limestone, buff, both dense and coarsely crystalline; a little gray limy shale	9	1217
Limestone, light brown, broken crystalline; some white chert	8	1225
Chert, white-both weathered and fresh; and some light brown broken crystalline limestone	15	1240
Limestone, light brown, dense; and brownish gray and buff chert	5	1245
Limestone, brownish-gray, dense	10	1255
No samples: drillers log-Lime, light brown	25	1280
Limestone, gray to buff, dense; a few fossils (1000' water at 1290)	22	1302

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H. LeBel #1

	Thickness (Feet)	Depth (Feet)
No samples; drillers log - Shale, gray	56	1358
Shale, gray - both flaky and muddy	117	1475
Limestone, gray, shaly; a little shale	8	1483
Dundee:		
Limestone, buff and brownish gray, dense, a trace of shale	3	1486
Limestone, light brown, dense; trace of shale	42	1528
Limestone, light brown, dense to broken crystalline (Show water 1592; Hole full wtr. 1600)	72	1600

Casing Record:
10" 300'
RH 1175'
6-5/8" 1425'

Commenced: 11/26/41
Completed: 12/16/41

DRY HOLE