GEOLOGICAL SURVEY OF OHIO
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JOHN H. MELVIN, State Geologist

Report of Investigations No. 6

Geology of Newport Township, Washington County, Ohio

By
WILLIAM H. SMITH

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GEOLOGIC MAP OF NEWPORT TOWNSHIP

WASHINGTON COUNTY OHIO

by William H. Smith

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1948

Base from U.S. Geological Survey Topographic Maps

Scale 1/62500

Contour interval 20 feet

EXPLANATION

- DUNKARD — Top of Waynesburg coal
- MONONGAHELA — Base of Pittsburgh coal
- CONEMAUGH
- STRUCTURE CONTOURS — Showing elevations of Uniontown coal

GEOLOGY OF NEWPORT TOWNSHIP, WASHINGTON COUNTY, OHIO

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INTRODUCTION

Newport Township has an area of 36 square miles and lies within the Appalachian plateau physiographic province in the eastern part of Washington County, Ohio. The township borders the Ohio River, and lies just a few miles upstream from the city of Marietta, (see Geologic Map, Plate I). Geologically this township is of particular interest because it is here that the Burning Springs anticline of West Virginia crosses the Ohio River to form the Newell Run uplift of Ohio which is one of the most marked structural features in the eastern part of this State, and along which an important oil field is located.

Field work in the area was done in connection with the summer mapping program of the Geological Survey of Ohio during the summer of 1947, and a report on the geology of the township was prepared by the writer as a masters thesis at Ohio State University during the winter of 1947–8.

This paper is intended to bring out some of the more important facts concerning the structure and stratigraphy of Newport Township, gained as a result of the writer's geological work in the area. No previous geologic work in the township has been sufficiently detailed to clearly establish the structure of the Newell Run uplift, and to supply outcrop maps of the coal beds, details of their thickness and character, and intervals between the coals and other key horizons.

Rocks between the middle of the Conemaugh and the upper Permian are exposed within the area and comprise about 800 feet of strata consisting mainly of shales, sandstones, limestones, mudstones, clays, and coals. The nomenclature and correlation of these strata are shown by means of graphic sections on Plate II. The coal beds are mostly thin and of poor quality, but may offer more promise in the future as a source for synthetic fuels manufactured from low grade coal deposits. Other valuable deposits are the limestones and calcareous mudstones which contribute to the agricultural value of the soils. Abundant sandstone is present, but it is mostly of poor quality, and little use has been made of it up to the present. The Newell Run oil field, located along the uplift, has been active since 1890, and is still the center of considerable drilling activity, although not to as great an extent as in the past when the oil pools of this area supplied a major part of Ohio's petroleum production.

STRATIGRAPHY

Approximately 800 feet of strata is exposed in Newport Township. This includes the strata in the upper half of the Conemaugh series and all of the Monongahela series of the Pennsylvanian system. Rocks in the Dunkard series of the Permian system overlie the Pennsylvanian, and comprise the youngest deposits in the area. Following is a brief account of the stratigraphy and lithology of each of these series in the area under discussion.

CONEMAUGH SERIES

The Conemaugh rocks are exposed over an area of about three square miles near the crest of the Newell Run uplift. This structure brings to the surface the Cow Run sandstone and other middle Conemaugh rocks that are generally more

than 250 feet below the level of the Ohio River in this part of eastern Ohio. Lithologically, the Conemaugh rocks consist mostly of sandstone, sandy shale, calcareous mudstone, thin beds of limestone, clay, and coal. The Ames limestone is exposed at the crest of the uplift, and represents the youngest known marine deposit in the section. Other important members in the Conemaugh deposits of the area are: the Harlem coal, the Elk Lick coal and limestone, the Clarksburg coal and limestone, and the Upper Pittsburgh limestone.

MONONGAHELA SERIES

Monongahela strata are exposed over the major part of the township, and the lithology of its strata is essentially the same as in the underlying Conemaugh except that there are more coal beds, and the strata are in general more uniform in character and interval. In Newport Township the Monongahela series contains shale, sandstone, mudstone, limestone, clay and coal. Of these the shales and sandstones comprise by far the largest proportion of the rocks. The limestones are few and thin, and the coals, with the exception of the Meigs Creek, which has been mined to some extent locally, are thin and of no value except as stratigraphic markers. The average thickness of the Monongahela strata in Newport Township is 240 feet, and the distribution of the rocks in this series is shown on the geologic map (Plate I).

Important marker beds in the Monongahela series are: the Pittsburgh coal and its overlying limestone, the Redstone and Fishpot coals, the Meigs Creek coal, the Uniontown coal, and the Waynesburg coal which comprises the uppermost bed of the series.

The extent and line of outcrop of the Pittsburgh coal, or where missing its horizon, marked by a disconformity at the top of the Conemaugh series, is shown by the black line representing the Conemaugh-Monongahela boundary on the accompanying map (Plate I) of this paper. Examination of the map shows that the outcrop of the Pittsburgh coal in Newport Township is restricted to a small area of about three square miles, where it is brought to the surface along the Newell Run uplift. In much of this area, especially along the axis of the uplift in Secs. 3, 4, and 33, ans along the west flank of Secs. 9 and 10, no trace of the Pittsburgh coal is found. In places the Upper Pittsburgh sandstone, or limestones that are normally found in the Pittsburgh coal–Upper Pittsburgh sandstone interval elsewhere in the township and throughout Washington County, rest disconformably upon the Upper Pittsburgh limestone. Where this situation prevails the Pittsburgh coal horizon was mapped at the contact of the Upper Pittsburgh limestone with the overlying Monongahela strata.

In Newport Township, and in general throughout the area of Monongahela outcrop in Washington County, the Uniontown coal is not of commercial value, but is a persistent formation and offers the most satisfactory single stratigraphic marker within the Monongahela series. It is for this reason that the structure contours on the accompanying geologic map (Plate I) are drawn on this horizon. The Uniontown coal varies within the township from a thin, carbonaceous streak to a coaly zone more than eight feet thick. These are, however, the extremes, and in the average section the coal zone has a thickness of one to three feet, the major portion of which consists of partings of various sorts. The most important factor contributing to the value of the Uniontown zone as a stratigraphic marker is its characteristic lithology. This very frequently is so pronounced that the geologist who is familiar with the section is able to locate his stratigraphic position in the field on the basis of the lithology of this coal bed without reference to any other members of the series; and often this may be done even where the coal is poorly exposed.

The two most distinguishing lithologic units found in the Uniontown coal member are: first, a coaly limestone often found near the center of the coal bed,

and second, a hard, fissile, carbonaceous or coaly shale overlying the limestone. The limestone is usually black and coaly, fine-grained, often nodular or lenticular, and together with the overlying shale generally contains ostracod carapaces, which frequently are so profusely abundant in the rock that it might well be termed an ostracod coquina. The thickness of this limestone seldom exceeds 4 to 6 inches, and where the Uniontown coal zone becomes thin the limestone is generally wanting. The black fissile shale bed is found a few inches to one foot or so above the limestone bed, and is often persistent in exposures where the limestone is entirely wanting. It is a jet-black, fissile, coaly shale, that is characterized by its hardness and by its tendency to split into paper-thin laminae. Its great value as a marker of the Uniontown horizon lies in its resistance to weathering, and to the manner in which it splits up into thin laminae that cover the weathered slope of outcrops that would be extremely difficult to locate without the aid of these shale chips.

The Benwood limestone, in the lower half of the Monongahela series, may offer an important future source of agricultural lime to the farmers of the area, and the Lower Sewickley and Sewickley sandstones have limited local use. The remainder of the Monongahela series consists mainly of shale and thin-bedded sandstones.

DUNKARD SERIES

Rocks of the Washington group of the Dunkard series are present in all of Newport Township except in the area of the Newell Run uplift. Over the uplift they have been eroded while around the flanks of the uplift the Pennsylvanian-Permian boundary is near the hilltops, and dips to lower elevations to the north, east and west. The Pennsylvanian-Permian boundary is shown by the black line on the geologic map accompanying this paper, and the area underlain by Permian rocks is shown by the solid green color. The rocks in the Dunkard series are quite variable in thickness and lithology. There are sandstones, shales, limestones, and coal; these strata undergo rather rapid changes in facies, and contain few persistent marker beds. There is a preponderance of shale and thin-bedded sandstones that often are gradational one into the other. These lithologically similar beds occur in various stratigraphic positions, and make the Permian strata exceedingly difficult to classify and define. In the eastern part of the township where the rocks are relatively flat-lying the base of the Permian system is 130 to 160 feet above the level of the major streams, and about 150 feet below the hilltops. In the northwestern part of the township the strata rise due to the influence of the Cow Run uplift and the Permian rocks are found nearer the hilltops. In southwestern Newport Township and in southeastern Marietta Township, the rocks dip toward the Parkersburg syncline, so that in the extreme southwest corner of Newport Township, the Washington coal is found near stream level. This places the base of the Permian about 140 feet lower, and allows for 550 or more feet of Permian strata in the higher hills of that area. The rocks in the lower part of the Green group are, therefore, due near the hilltops in the southwest corner of the township, but outcrops in this small area are so few and so poor that no detail concerning the rocks of this group was obtained.

STRUCTURE

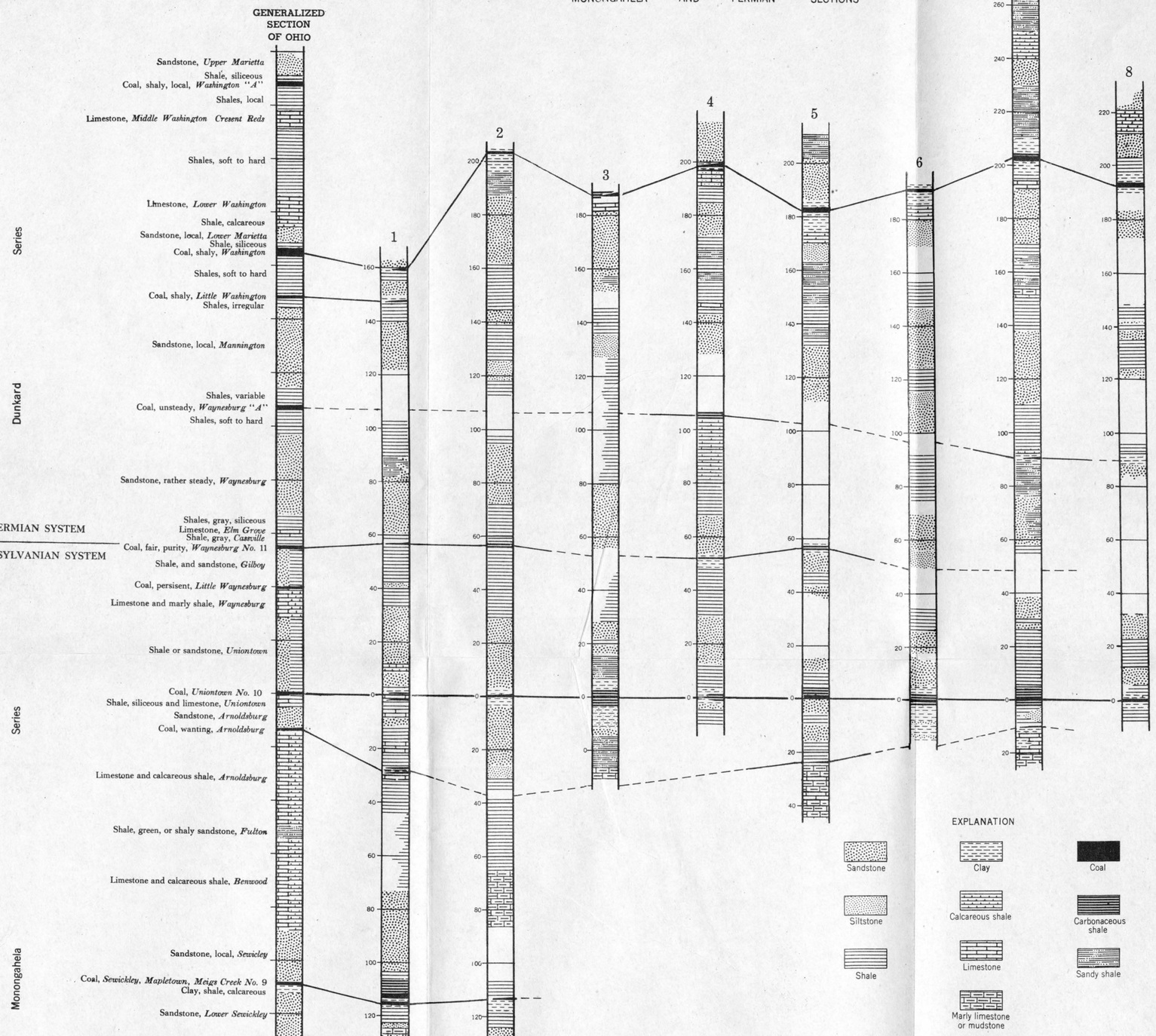
The area and extent of the Newell Run uplift and other structural features in Newport Township are shown by structure contours on the geologic map (Plate I). These contours give the elevation above sea level of the base of the Uniontown coal horizon, which is the most persistent, and the most widely distributed stratigraphic datum plane in the township. Examination of the map shows that

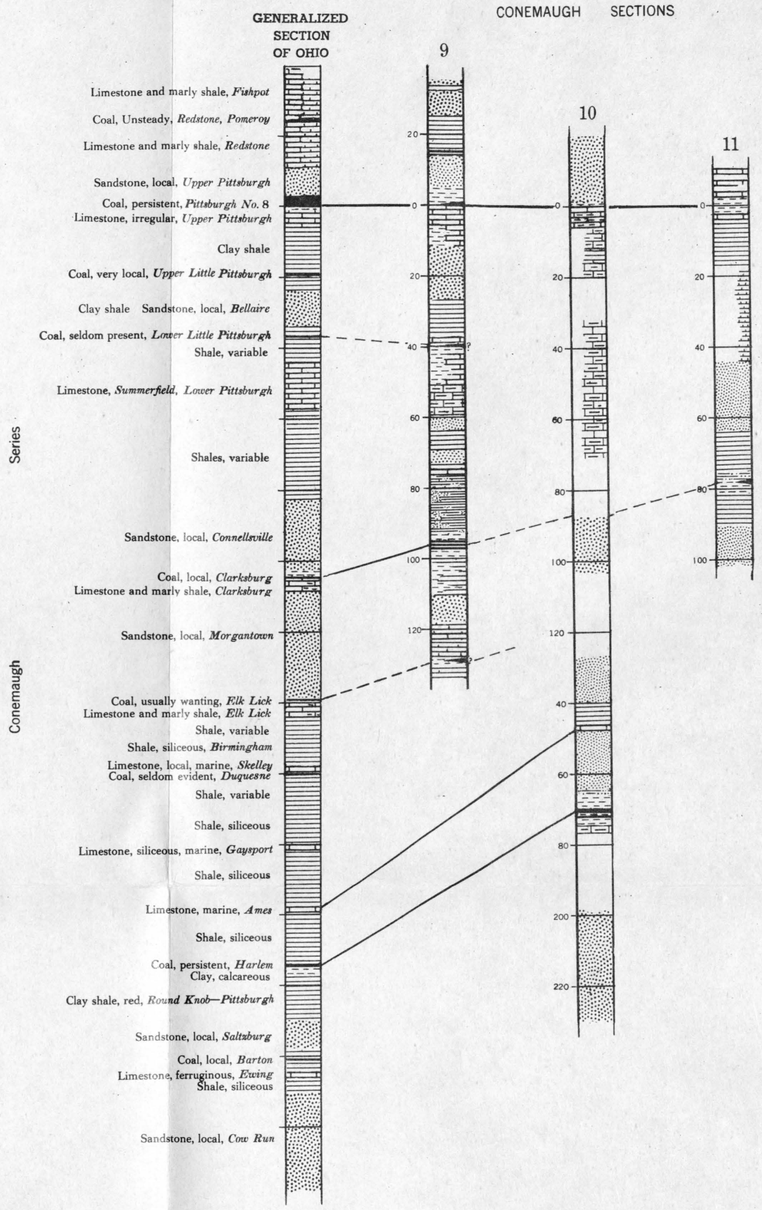
the axis of the Newell Run uplift enters Ohio in the NW¼ Sec. 33, and extends north-northwestward into Sec. 11, where the structure flattens and dies out. The reader will note from examination of the map that the dips on the east flank of the structure are considerably steeper than those on the west flank where the strata dip to the southwest at a rather uniform rate of about 80 feet per mile toward the axis of the Parkersburg syncline. The Parkersburg syncline, which is a very prominent structural feature in West Virginia, extends northward into Ohio with its axis crossing the Ohio River near the eastern edge of the city of Marietta, 10 miles west of the axis of the Newell Run uplift.

Another prominent structurally high area in the township is located in Secs. 18 and 24, near the northern border of the township. This structural rise is due to the influence of the Cow Run uplift, the center of which lies on Cow Run about 1 mile north of the Newport Township line. Field work was carried on in the area of the Cow Run structure by Dr. A. T. Cross who did mapping for the Geological Survey of Ohio in that region during the summer of 1947. However, the mapping of this structure has not yet been completed, and for this reason, the northward continuation and the exact trend of the structural high in Secs. 18 and 24 of Newport Township cannot be very definitely predicted on the geologic map with this report.

There is a sharp change in the trend of the anticline at or very near the Ohio River where the structure makes a sharp swing from a northeasterly trend on the West Virginia side of the river to a northwesterly trend on reaching the Ohio side. The writer had previously thought it possible that this sharp change in the trend of the structure near the Ohio-West Virginia boundary might be present only in the upper strata, and that it might not be reflected in the deeper rocks. However, regional sub-surface maps prepared by the geological department of one of the major oil companies that has done considerable research in the area, offer convincing evidence that this abrupt change in trend is present, and that it is reflected in the rocks at least to the depth of the Berea sandstone. These maps, contoured on the Berea sandstone, show a structural trend similar to that shown on the geologic map (Plate I) included with this paper. The Berea sandstone was reportedly reached in drilling at an elevation of approximately 793 feet below sea level in the NW¼ Sec. 33, at the highest point on the Ohio structure. From this point the structure contours on the Berea sandstone indicate that the structure plunges northwestward in a manner similar to that shown by the structure contours on the map (Plate I) with this paper. The structural high on the Berea does not, however, plunge out to as great an extent as is indicated in the surface rocks, but rather it continues on, rising again to 1,070 feet below sea level on reaching the Cow Run uplift. From the Cow Run uplift northwestward, the Berea structure flattens into a broad low arch that continues to express itself in the structure contours until it reaches a point near the Washington-Noble County line. This northwest trend, shown on the structure map of the Berea sandstone, continues northwestward from the Newell Run uplift, through the Cow Run uplift, and northwestward to the Washington-Noble County line. This trend is nearly parallel to the trend of the Cambridge arch, and to the trend of the Parkersburg syncline, which are two of the major structural features in eastern Ohio.

Although detailed maps are not yet completed showing the structure of the Cow Run uplift as expressed in the surface rocks, it appears to have an essentially east-west axial trend. If this is correct then the trend of the Cow Run uplift is approximately at right angles to the northwest trend shown for the Newell Run uplift which, as expressed in the surface rocks, dies out on the west fork of Newell Run about 2½ miles north of the Ohio River, and two miles southeast of the Cow Run uplift.





COLUMNAR SECTIONS OF PENNSYLVANIAN AND PERMIAN STRATA IN NEWPORT TOWNSHIP, WASHINGTON COUNTY, OHIO

by William H. Smith

GEOLOGICAL SURVEY OF OHIO
John H. Melvin State Geologist
1948

INDEX MAP SHOWING LOCATION OF SECTIONS

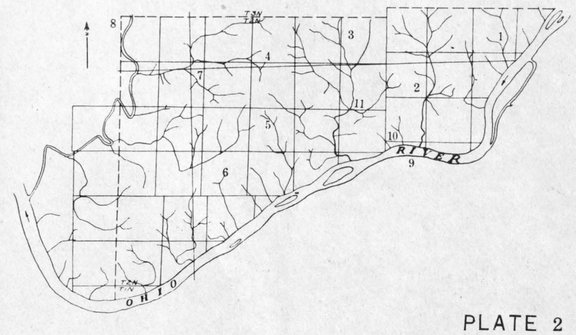


PLATE 2

ECONOMIC DEPOSITS

On the whole, there is little in the way of geological deposits except oil and gas in Newport Township that is of any commercial value. In the past, the coal beds have yielded some coal for local use, but they are not being worked at the present due to the thinness and poor quality of the deposits. These low grade coals may, however, be used at some future date in the production of synthetic fuel. Aside from the coal seams and petroleum products, the sandstones and limestones are the only other commercially useful deposits. There is a great deal of sandstone present in the township, but none is of much value for building stone or other economic use. There are no appreciably thick limestone deposits in Newport Township, and those present are in general too thin to be successfully quarried for use as agricultural lime or other purposes. A possible future supply of agricultural lime, which may be obtainable from the Benwood member, is suggested in the discussion of the limestone deposits.

COAL DEPOSITS

On the generalized stratigraphic section of Ohio (Plate II), are shown seventeen coal horizons that occur within the rock section exposed in Newport Township. Although all of these are not recognized, most of them can be identified, and the graphic sections on Plate II indicate those that are present and their correlation within the township. Of these the only ones that offer promise from an economic point of view are the Meigs Creek, Uniontown, and Washington, each of which will be discussed briefly.

The Meigs Creek coal was mined on Cow Run in the early days of oil exploration to furnish power for the steam drilling rigs, and is at present mined commercially at Moss Run located 1½ miles north of Cow Run, and three miles north of the Newport Township boundary. Along Bolivian Run in the S½ Sec. 6, Newport Township, there are several abandoned drift mines in which there was reportedly two and one-half to four feet of mineable Meigs Creek coal. None of these mines has been active since the depression years of 1930–1936, and it is reported that in these mines the coal bed was rather irregular, and that a number of clay rolls and cutouts were encountered in the mining. Over the major part of Newport Township the Meigs Creek does not attain sufficient thickness to be mineable, and in the area near Bolivian Run it is only of marginal mining thickness and does not warrant the effort necessary to get it out except during times of shortage or depression. It is therefore doubtful that the Meigs Creek deposits will ever warrant future development, except perhaps in connection with underground gasification projects that might be located in the Moss Run mining district a few miles to the north.

The Uniontown coal, which is found on the average of 110 feet above the Meigs Creek, is of no economic importance in Newport Township at the present time, although with the recent advancements in synthetic liquid fuels manufacture from low grade coals it is possible that in the future it may be of use as a source of raw material for this purpose. In the western half of the township exposures of the Uniontown indicate a thickness that would perhaps warrant analysis of the full zone of coal and coaly shales to determine their yield of oil per ton, after which coring would be advisable if the analysis proved favorable.

The Washington coal together with the Meigs Creek comprise the only two mineable coal beds in Newport Township. The Washington coal has been mined in the hill north of Long Run in the SW¼ Sec. 22 at an elevation of 928 feet. The mine is now caved in, but the owner reports that the coal bed attained a maximum thickness of forty-nine inches in this mine. He states, however, that the coal thinned rapidly after the drift entry had been driven twenty or thirty feet into the

hill, and that because of the thinning the mine was abandoned. The rocks dip to the southwest in this area due to the influence of the Parkersburg syncline, which brings the coal nearer stream level in the southwestern corner of the township, where the Washington coal has also been mined in a small way for house coal. The coal is reported to have an average thickness of about two feet in these mines, but because of its thinness and poor quality it has never warranted commercial mining. The Washington coal generally has a high ash content throughout its extent in eastern Ohio, and those who have mined this coal in Newport Township state that although it is soft, it burns well, but leaves a great deal of ash.

SANDSTONE DEPOSITS

The sandstone deposits in Newport Township have not been found of much economic use up to the present. Unless the area becomes industrialized, and new uses are found for the sandstones, there probably is little chance that they will be used to any large extent in the future. Most of the sandstone deposits are rather soft and are either thin-bedded or shaly in character. Both of these factors detract from the value of the stone for building purposes. No quarries are known to have operated in the township, and about the only use made of the sandstone up to the present has been very limited local uses, such as for house and barn foundations, bridge abutments, and crushed rock for road building. For most of these purposes the stone at hand has been used and thus nearly all of the sandstones that outcrop within the township have been used at one place or another.

Sandstones in the Conemaugh series outcrop over such a small area that no particular use has been made of them. The Monongahela sandstones, which include the Upper Pittsburgh, the Lower Sewickley, the Sewickley, and at places the Arnoldsburg and Uniontown, have found more widespread use than the Conemaugh sandstones due to their greater distribution. Of these the Sewickley receives the greatest amount of use, but it weathers so rapidly that it is doubtful that any commercial use except perhaps sand manufacture could be made of it.

The Permian sandstones in Newport Township, which include mainly the Waynesburg and the Mannington, are either too flaggy, or else too soft to be of much value. The Upper and Lower Marietta sandstones come into the section along the Ohio River in the southwest corner of the township where they form prominent cliffs along the river bluff. Both of these sandstones are quarried extensively a few miles farther west near the city of Marietta, where the stone is used mainly for the manufacture of grindstones. The Marietta sandstones in Newport Township do not, however, attain the thickness and quality that they have near Marietta, and will probably not find use unless the Marietta deposits become depleted.

LIMESTONES DEPOSITS

In the exposed rocks of Newport Township there are only a few thin nodular beds of limestone, of which the Arnoldsburg is the only important one. There are, however, thick deposits of calcareous mudstone in the Lower Monongahela and in the Conemaugh that furnish abundant lime to the soil along their outcrop and that may offer a future source of agricultural lime for the township. The economic value of these deposits lies in their use as a source of lime for agricultural purposes, but little use has been made of them up to the present. However, there is a decided need for lime in most of the soils of the township, and an adequate supply of lime would add much to the economy of the area by permitting the raising of more alfalfa and other legume hay crops as well as other agricultural products that do best in well limed soil.

In general, the Arnoldsburg is not of sufficient thickness to be quarried out for crushing, and for this reason has not been used to any extent. One account re-

garding its use was cited to the writer by a farmer who gathered field stones weathered from the outcrop of the Arnoldsburg and had them crushed for agricultural lime. The Benwood member, on the other hand, has an extensive distribution over all but the southwest corner of the township, and attains a thickness of from thirty to sixty or more feet. It is a highly calcareous red mudstone containing small pellets of hard, white limestone. In the writer's opinion this mudstone may find extensive use in the future as a cheap and readily available source of agricultural lime.

In view of the abundance and availability of the Benwood member in Newport Township, a thorough study of it seems advisable in order to determine its acid neutralizing power and methods by which, if it proves to be of value, it might be mined and distributed to the farmers in the area.

OIL AND GAS DEPOSITS

Newport Township has long been important as an oil and gas producing area, and many hundreds of wells have been drilled there since the initial well was drilled in 1890. No complete record of the number of wells drilled in the township, or production figures, etc., concerning the many wells that have been drilled is known to the writer and it is doubtful if any such record has ever been maintained, although Bownocker[1] states that there were 300 producing wells in the township in 1900. The oil fields of the township are old fields that had their major development during the period between 1890 and the early 1900's. The area is, however, still active, and there are probably several hundred wells in the township that are producing at the present time. Most of these are old wells that only produce a few barrels a week, but are still worth being pumped. New wells are being drilled in the township, but seldom produce more than five to ten barrels a day, and are operated almost exclusively by individuals and small companies made up of local citizens.

The principal productive area in Newport Township is the Newell Run pool, located in the area of the Newell Run uplift, and extending northwestward into Sec. 13 of Independence Township. This practically unites the Newell Run pool with the Cow Run pool. There are also two other minor producing areas in the township. One is the Sand Hill pool, located principally in Marietta Township, but extending eastward into Secs. 33, 27, and 22 of western Newport Township, and the other is the Bosworth pool, located on the east side of the Newell Run uplift. There are also numerous other producing wells in the township that do not fall within the limits of either of the above three producing areas. These wells are scattered throughout the township and do not follow any noticeable trend or pattern.

The production in Newport Township is obtained primarily from the First Cow Run and the Berea sands. The First Cow Run sandstone belongs stratigraphically about in the middle of the Conemaugh series. It was the principal producing sand in the early days of the field, and is still producing in a number of wells. The up-dip of the rocks along the anticline brings the Cow Run sandstone above the level of the Ohio River near the mouth of Conley Run in the NW $\frac{1}{4}$ of Sec. 33, where a 29-foot cliff of the sandstone is exposed. From here the northwest plunge of the anticline carries the sandstone under cover where it is reported by Bownocker[2] to be struck at a depth of 300 feet on Peggs Run in Sec. 11, and at a depth of 478 feet on Eightmile Creek, in the NW $\frac{1}{4}$ of Sec. 18.

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[1]Bownocker, J. A., "Occurrence and Exploitation of Petroleum and Natural Gas in Ohio," Ohio Geol. Survey, 4th ser., Bull. 1, pp. 181–185, 1903.

[2]Bownocker, J. A., "Occurrence and Exploitation of Petroleum and Natural Gas in Ohio," Ohio Geological Survey, 4th ser., Bull 1, pp. 181–185, 1903.

The second Cow Run, or Priest sand, is found 400 feet below the First Cow Run. This sand is stated to be relatively unimportant, and to supply only a few productive wells in the township. Below the Second Cow Run, and above the Berea, there are several other sands that are occasionally productive at various places in the area. Among these are: the Salt sand, the Maxton sand, the Keener sand, the Big Injun sand, and the Squaw sand.

The Berea is now the principal producing sand in this area, and is the objective of most of the drilling being done in the township at the present. The Berea was reportedly found at a depth of 793 feet below sea level in a well located near the outcrop of the Cow Run sandstone at the mouth of Conley Run. This would place the well near the level of the top of the First Cow Run sandstone, and indicates an interval of approximately 1,400 feet between these two producing horizons in this area. The Berea is much more persistent than most of the shallower sands, and from a geological point of view, offers a very valuable horizon on which subsurface mapping may be done.

Production from horizons below the Berea has not as yet been successfully obtained in the area. Several deep tests, one reportedly over 7,000 feet deep, and forming one of the deepest tests in Ohio, have been drilled within a few miles of Newport Township, but have not been successful in obtaining production. To the best of the writer's knowledge, no deep test has yet been drilled on the Newell Run structure, but there reportedly is one currently being put down on the Burning Springs anticline at Volcano, West Virginia. If this well is successful in obtaining production from horizons deeper than the Berea, it will probably lead to renewed activity in the area and to the drilling of a deep test on the Newell Run uplift, in which case, the structure map (Plate I) with this report may prove useful by indicating the trend and closure of the structure as reflected in the surface rocks.