U. S. Geological Survey:

REPORTS-OPEN FILE SERIES,
NO. 704: 1964.

U. S. Geological Survey
[Reports - Open file series]

cop 1

GRAVEL RESOURCES IN THE PATUXENT FORMATION OF CRETACEOUS AGE IN THE BELTSVILLE QUADRANGLE, PRINCE GEORGES AND MONTGOMERY COUNTIES, MARYLAND

by

C. F. Withington
U. S. Geological Survey

Map in map drawer

UNITED STATES
DEPARTMENT of the INTERIOR

★★★★★★★★★★★★★★★★★★★★★news release

GEOLOGICAL SURVEY

Forrester - 343-4646

For Release to PM's, JANUARY 22, 1964

RICH GRAVEL RESOURCES REPORTED NEAR WASHINGTON, D. C.

Significant gravel resources appear to be generously distributed near Beltsville, Maryland, just northeast of the Nation's Capital, according to an announcement by the Geological Survey, U. S. Department of the Interior.

This is the conclusion of Charles F. Withington, one of a team of Survey engineering geologists, who are undertaking a comprehensive investigation of metropolitan Washington, D. C. aimed at updating geologic knowledge of the region.

"Some of the better gravels in the United States are found near Beltsville," said Withington.

The Survey geologist said that because of the rapid growth of the suburbs, the available gravel resources around Beltsville--of significant importance to construction, planning and transportation interests--are being depleted at an ever increasing rate.

"Increased urbanization," Withington pointed out, "may extend over areas underlain by much of the remaining gravel. A preliminary map and report just released shows where prospecting might uncover new deposits of gravel, thus serving as a guide to future planning and zoning in the Beltsville community."

The preliminary map shows that most of the gravel occurs in shoestring-shaped "channels" that are believed to be part of an ancient river system that existed 100 million years ago. It occurs in rocks which geologists refer to as the Patuxent Formation. The gravel particles range from buckshot-sized granules to elongated cobbles ten inches long. Although the gravel is found throughout the formation, and is mixed with sand and clay, it is most common at the upper 50 feet.

Tremendous amounts of sand and gravel are used throughout the United States as aggregates in concrete and in the construction of highways. In 1962, about 777 million tons were produced in the United States. Of this, 12.7 million tons, valued at nearly $17 million was produced in Maryland, with Prince Georges County producing the most, about 6.9 million tons. By 1970 annual production of sand and gravel in the United States is expected to amount to about one billion tons.

The map and report on the gravels in the Beltsville area may be examined in the Geological Survey Library, 18th & F Streets, N. W., Washington, D. C. The preliminary "open file" map is the first map to be released under the current urban geologic mapping project of the D. C. area, and is part of a large project involving the preparation of new engineering geologic maps for many major cities of the United States.

x x x

GRAVEL RESOURCES IN THE PATUXENT FORMATION OF CRETACEOUS AGE IN THE BELTSVILLE QUADRANGLE, PRINCE GEORGES AND MONTGOMERY COUNTIES, MARYLAND

by

C. F. Withington

Abstract

Gravels in the upper part of the Patuxent Formation of Cretaceous age are the principal construction material resources in the Beltsville quadrangle, Maryland. The location of undeveloped deposits will be helpful in future planning and zoning of this area. These gravels are associated with sand and clay and consist of rounded to subrounded fragments of quartz and quartzite. A map that shows the distribution of these gravels in the Beltsville quadrangle was made by plotting estimated ratios of gravel to sand-clay as determined from logs of drill-holes, gravel pits, and outcrops. Points of ratios of gravel to sand-clay of 1:1 and of 1:5 were contoured. The distribution of the gravels indicates they were deposited in a system of river channels of Cretaceous age with the thickest gravel deposits occurring in the channels and the sand and clay predominate elsewhere. Channel axes and associated crossbeds, many of which are preserved in iron-cemented material at the top of the Patuxent Formation, show that direction of deposition is toward the south or southwest. Prospecting for new deposits in the Beltsville and adjacent quadrangles most likely will be successful along the projected line of the channels.

Rapid growth of suburban Washington, D. C., has established a need to evaluate the mineral resources within the metropolitan area so full utilization can be made of these deposits. As part of a continuing investigation of the engineering geology of the Washington metropolitan area, a study has been made of the occurrence and distribution of the gravel resources in the Patuxent Formation of Cretaceous age that crops out in the northeastern part of the Beltsville quadrangle, Montgomery and Prince Georges Counties, Maryland. Gravel deposits occur in other formations within this area but they are generally of poor grade.

The Patuxent Formation consists predominantly of sand and clay with lesser amounts of gravel. In the Beltsville quadrangle it overlies crystalline rocks, mostly quartz-mica schist. The western boundary of the formation is roughly along the Montgomery-Prince Georges County line, where the formation either is covered by younger gravels or pinches out against the crystalline rocks. To the east, the Patuxent disappears beneath the Patapsco Formation roughly along U. S. Route 1. The sand is crossbedded and consists of coarse to fine, yellow and purple, subangular to subrounded quartz grains, and is in places micaceous. The clay occurs as beds and lenses throughout the formation and is mostly white, although some is red and yellow. The gravels are generally poorly sorted and consist of subrounded to rounded quartz and quartzite particles and minor amounts of chert. Particles range in size from elongate cobbles as much as 10 inches in longest dimension to buckshot-size granules. The gravel deposits occur throughout the formation, but are most common either at the base or within the uppermost 50 feet. The gravels at the base are poorly exposed, but appear to be no more than 10 feet thick. Those at

the top are more extensive and occur as channel fillings, which average about 15 feet in thickness. Some are as much as 50 feet thick. Iron oxide cements much of the lower and upper parts of the formation and is concentrated as a cap at the contact of the Patuxent Formation with the clay of the overlying Patapsco Formation. Where the upper facies of the Patuxent Formation is sand, the cemented layer is thin and friable, but where the upper facies is gravel, the cemented layer is as much as 5 feet thick and well cemented. The thickness of the iron-cemented material is directly proportional to the thickness of the gravel.

The Patuxent Formation is covered by younger gravels in the vicinity of White Oak and High Point and by alluvium along Indian Creek, Paint Branch, and Little Paint Branch. The alluvium consists of poorly sorted gravel, sand, and clay derived from the surrounding rocks. The gravels along Indian Creek are like those in the Patuxent Formation. To the north, the outcrop pattern of this formation is interrupted by the Patuxent River Valley.

The channel shape of the gravel bodies, the fore-set beds exposed in gravel pits, and the areal distribution of the gravel units suggested the presence of channels of an ancient river system in the upper part of the Patuxent. In order to confirm the presence of this apparent system and to determine the distribution of buried gravel deposits, ratios of the amount of gravel to sand and clay in a vertical section were estimated and lines were drawn to connect points of ratios of 1:1 and 1:5 (gravel/sand-clay), using data from drill-hole logs as well as field observations in gravel and sand pits and other exposures. As the thickest gravel deposits invarably occur within the channels, the 1:1 ratios are assumed to represent

the boundaries of the channels. The gravel, of course, is not evenly distributed within the channels, because the rivers meandered and their transporting power varied within the channels as the current alternately impinged on the opposite banks. Directions of deposition as shown in channel axes and associated crossbeds were measured wherever possible and were plotted on the accompanying map. The result is a map that shows the location of the deposits of a Cretaceous river system that drained south and southwest across the quadrangle.

The surface drainage during Patuxent time has never been established for the Beltsville area (Darton and Keith, 1901, p. 6). Clark (Clark, Bibbons, and Berry, 1911, p. 80-81) observed that the Patuxent contained none of the sandstones of the Newark group, which lies directly west of the Washington area; nevertheless he believed that the drainage was from the west, and that rocks of the Newark group were either less resistant than they are now, or that during Patuxent time the rocks were covered by water.

The gravels in the Beltsville quadrangle do not contain mica or fragmentsof any of the sedimentary and metamorphic rocks that are present directly to the west and northwest. Moreover, because of their composition, the gravels can be classed as mature (Pettijohn, 1957, p. 253). They must therefore have traveled from the north a considerable distance, perhaps as far as 100 miles.

The rivers that deposited the gravels flowed in shoestring-shaped channels across a surface of low relief on the sands and clays of the lower and middle Patuxent Formation. Although the sands in the interstream area are in places micaceous, those in the river channels are not;

therefore, it is assumed that little material was contributed to the channels from the inter-stream area. Although some gravels are found outside the channels, the amount is not great and it is apparent that the material contributed to the inter-river area from the channels was restricted to periods of infrequent flooding.

The lack of fossils other than silicified wood fragments precludes any description of the ecology of the area.

Any prospecting for new deposits of gravel should be done along the extension of the channels, both in the Baltsville quadrangle and in the adjoining quadrangles. Areas in which a thin cover of clay of the Patapsco Formation obscures the gravel should not be overlooked.

Literature Cited

Clark, W. B., Ribbons, A. B., and Berry, E. W., 1911, The Lower Cretaceous Deposits of Maryland: Maryland Geol. Survey, Geol. Rept. 4, p. 23-98.

Darton, N. H., and Keith, Arthur, 1901, Description of the Washington, [D. C.] quadrangle: U. S. Geol. Survey Geol. Atlas, Folio 70, 7 p.

Pettijohn, F. J., 1957, Sedimentary rocks: New York, Harper Bros., 2d ed., 718 p.