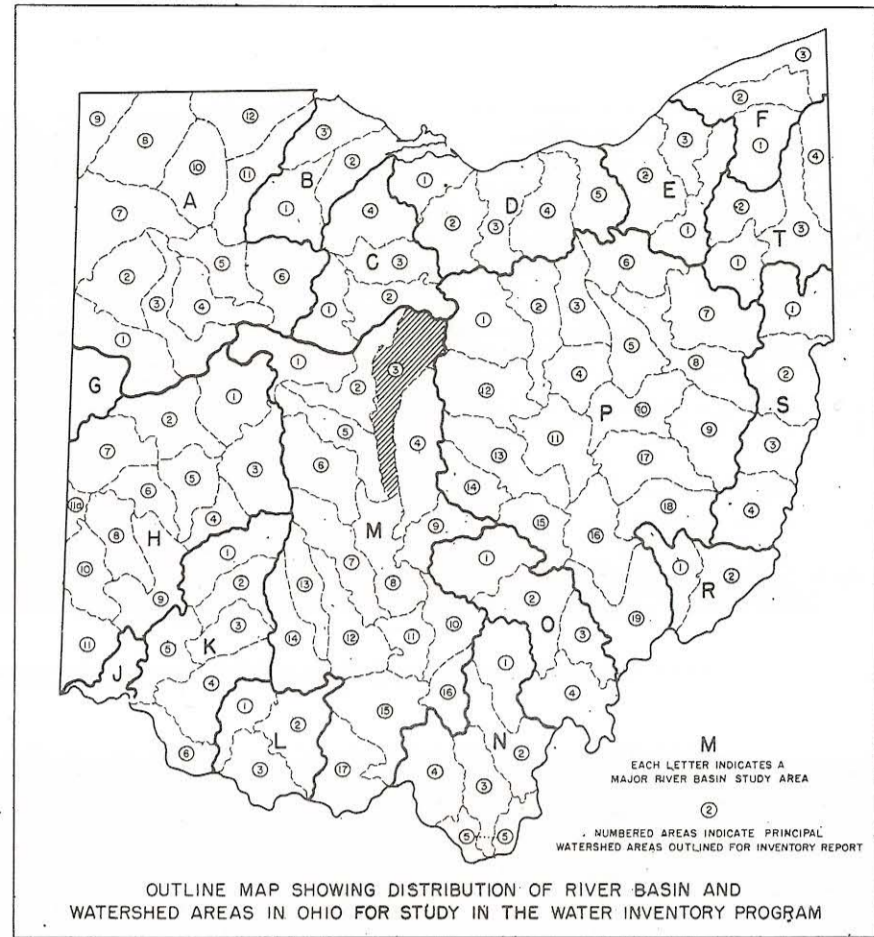
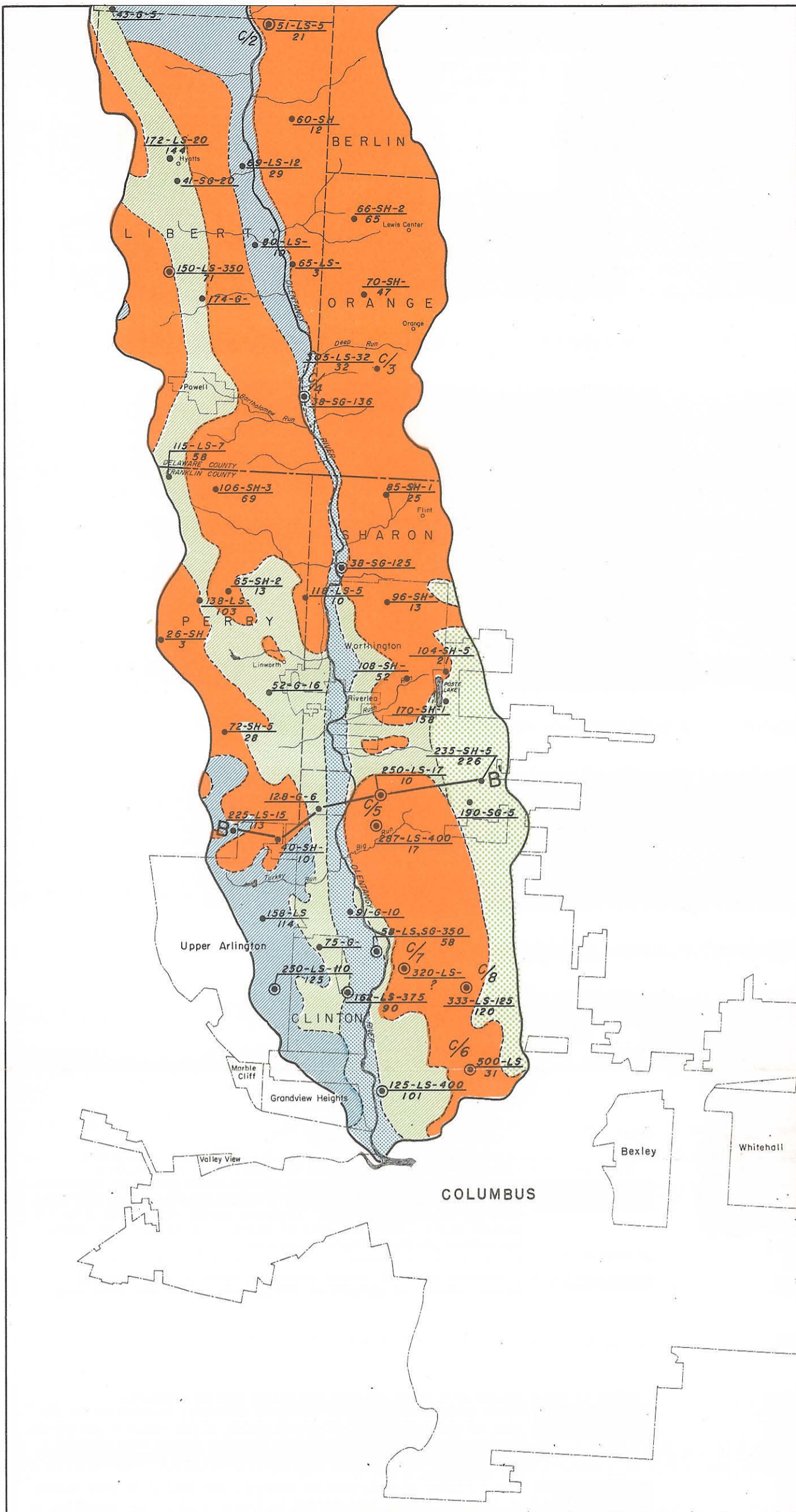


OHIO WATER PLAN INVENTORY
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OLENTANGY RIVER BASIN

UNDERGROUND WATER RESOURCES

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Rock formations of the earth are natural underground reservoirs. A part of the water that is derived from rain or snow is stored temporarily to supply wells and springs or to maintain the flow of streams during periods of low flow. The quantity of underground water available depends on the number, kind, and size of water-bearing pores or cracks which are a part of the physical characteristics of rock formations. Limestone is dissolved by percolating waters and the water is temporarily stored in solution channels and crevices and not in the pore spaces. Sandstone is composed of sand grains cemented together. The size of the grains may vary depending on the particular formation and location. Therefore, the quantity of water stored depends on the porosity of the formation. Shale may store sizeable quantities of water; however, it is generally very dense and will not transmit water freely. Sand and gravel deposits are usually considered as being the best type of aquifer, yet, their permeability, thickness and regional extent control the quantity of water available.

Rock that crops out in the Olentangy River Basin comprises two major units: (1) consolidated sedimentary layers of limestone, sandstone, and shale, which form the bedrock and (2) unconsolidated glacial deposits of sand, gravel, and clay. The unconsolidated glacial deposits cover the entire basin yet, regionally, they are the least important of the two major units with respect to the availability of underground-water supplies. The consolidated limestone, shale and sandstone rocks underlie the glacial deposits and crop out in the beds and on the steep sides of some of the major streams.

Underground-water conditions are not uniform throughout the basin. They vary as to the character of the bedrock, the thickness, and the physical characteristics of the glacial drift. The map shows the potential underground-water conditions that exist. The geologic formations that lie beneath the area are described in the generalized section.

The water-bearing bedrock formations of the Olentangy River Basin are the Silurian and Devonian limestone formations beneath the western half of the area, and the Mississippian sandstone beneath the northeast section. The Devonian limestone formations which lie beneath 20 to 125 feet of glacial clay till, dip to the east at the rate of approximately 26 feet per mile. These formations are overlain with successively younger strata of Devonian and Mississippian shale and sandstone. Cross sections A-A' and B-B' illustrate these conditions. Wells developed in the limestone have reported yields of as much as 400 gallons per minute (gpm). These limestone formations have high potential yields whether they occur beneath the glacial drift or shale. However, the quality of water available to limestone wells, drilled in the eastern portion of the basin, may be suitable only for a limited number of industrial uses.

The Berea sandstone of Mississippian age, is the principal aquifer in the northeast section of the basin. Variable yields are reported, ranging from 5 to 100 gallons per minute which are attributed to the variable thickness and permeability of this formation. Glacial drift ranging from 22 to 157 feet covers the Berea sandstone and some domestic supplies are developed in these deposits. Wells drilled in the region northeast of Mt. Gilead do not reveal the sandstone. Evidence is not conclusive at the present time to definitely assert that the Berea sandstone is present.

The central portion of the basin is underlain with this thick ground moraine overlying Devonian shale. With few exceptions, drilled wells in this region develop less than 5 gallons per minute from stringers or lenses of sand and gravel infrequently scattered in clayey till. The shale bedrock is considered to yield little or no ground water; however, wells often develop less than 2 gallons per minute in the upper weathered surface of this formation. Wells have reported as much as 65 gallons per minute from very shallow lenses of sand and gravel deposited above the shale. These wells in the vicinity of Cardington are an isolated case and are not representative of the area.

The unconsolidated glacial deposits which fill the valleys of ancient drainage systems offer large volumes of underground water locally. These deposits, which fill the buried channel adjacent to the Olentangy River, consist of relatively thick lenses of sand and gravel interbedded in clayey till. Wells have reported yields of 300 to 340 gallons per minute from these glacial deposits. Wells that do not develop adequate supplies from these deposits may be drilled into the underlying limestone.

The marginal areas adjacent to, and tributaries of, this buried channel have a potential yield of as much as 25 gallons per minute. These glacial deposits are as much as 120 feet thick and overlie limestone or thin layers of shale bedrock depending on the exact location of the well. As much as 400 gallons per minute are assured from the underlying limestone, although, the percentage of hardness, dissolved solids, sulphates, and hydrogen sulphide increases with the depth of the well.

The buried valley located at the extreme southeastern edge of the basin offers domestic supplies only. As much as 10 gallons per minute may be developed in thin lenses of sand and gravel interbedded in thick clayey till. The estimated thickness of these deposits is in excess of 225 feet.

Thin to thick glacial moraine deposits are present adjacent to and overlying the western edge of the Berea sandstone. These deposits yield 5 to 25 gallons per minute, although the City of Mt. Gilead has developed as much as 395 gallons per minute from these deposits located adjacent to Whetstone Creek. These glacial deposits yield adequate farm and domestic supplies and serve as a large recharge area for the underlying sandstone formations to the east.

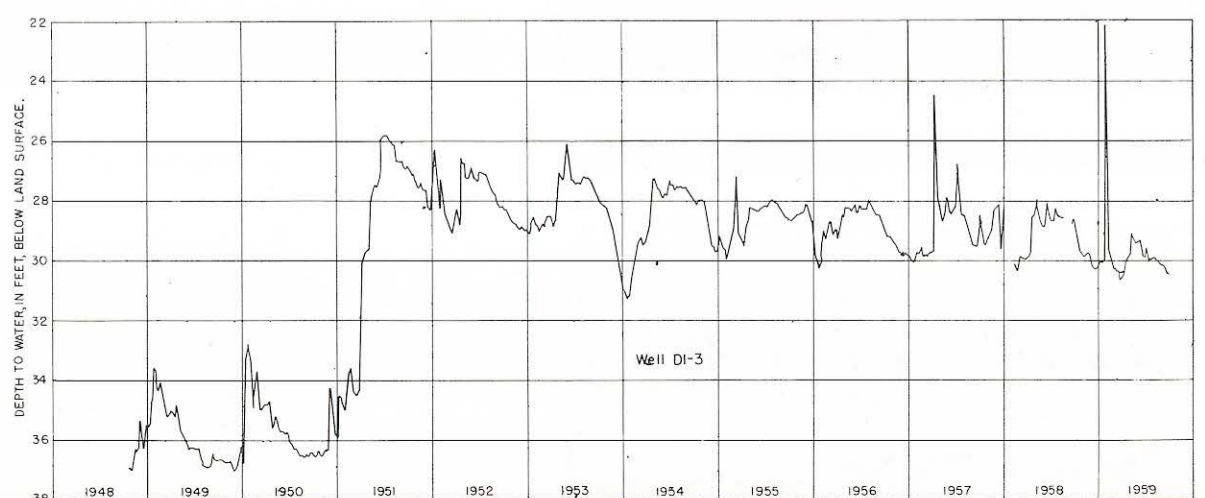
The locations of typical wells are shown on the map. The chemical analysis (C-1) for the ground-water supply used by Mt. Gilead is tabulated under quality. This well is finished in sand and gravel and was analyzed by the Ohio Department of Health. Samples from the remaining wells were analyzed by the Quality of Water Branch, U. S. Geological Survey.

QUALITY OF WATER

Partial analyses of the water from sand and gravel and limestone are shown in the table. The majority of the wells contain iron in excess of 0.3 parts per million (ppm). Samples from wells C-3, C-6, C-7, and C-8 have a high percentage of hydrogen sulphide and the water should be treated.

Well number	C-1	C-2	C-3	C-4	C-5	C-6	C-7	C-8
Depth (ft.)	---	125	305	38	250	500	320	333
Water-bearing formation	Sand and gravel	Limestone	Limestone	Sand and gravel	Limestone	Limestone	Limestone	Limestone
Parts per million								
Iron	2.5	.52	.26	.11	1.6	.77	9.9	.23
Dissolved solids	411.	1777.	2840.	407.	1802.	2462.	647.	1800.
Total hardness	298.	1285.	2010.	374.	1320.	1740.	402.	1350.
pH	7.1	7.1	7.3	7.3	7.7	7.3	7.3	7.1
Hydrogen sulfide	---	---	16.	---	0.1	0.7	24.	7.3

The hydrograph for the observation well in Delaware County shows the relation between the static level in a well, located at the toe of the Delaware Dam, and the level of the water behind the dam. The sudden rise coincides with the closing of the gates on the then new Delaware Dam in 1951. This new level is comparable to the fluctuations shown previously but at a higher level. Long-term fluctuations follow the annual cycle of recharge and depletion.



GENERALIZED STRATIGRAPHIC SEQUENCE OF THE ROCKS IN THE OLENTANGY RIVER BASIN

System or Series	Group or Formation	Character of Material	Water-bearing Characteristics
Quaternary	Recent	Clay, silt and alluvium deposited on flood plains of principal valleys.	Generally poor ground-water source owing to absence of coarse material.
	Pleistocene	Relatively thick lenses of sand and gravel interbedded in thin layers of clay till.	Yields of up to 360 gallons per minute have been reported from deposits in the buried valley adjacent to the Olentangy River. Regional potential estimated to be 250 gallons per minute.
		Thin bedded limestone with some argillaceous limestone concretions.	Wells in the vicinity of Mt. Gilead report 300 gallons per minute, although average yield for the area is likely 5-25 gallons per minute. Quantity of water available depends upon lenses of sand and gravel in clay till. Yields of 1-5 gallons per minute may be expected.
Mississippian	Berea	Till, a heterogeneous mixture of clay with a few stringers of sand and gravel. Clay is predominant.	Adequate farm and domestic supplies. Wells generally yield 5-10 gallons per minute.
	Bedford	Thin lenses of sand and gravel interbedded in thick layers of clay till which fill buried valley to a depth of more than 225 feet.	Gradational sandstone of variable thickness and permeability.
Devonian	Ohio	Soft, gritless, argillaceous shale.	Yields of 100 gallons per minute reported, although average yield is more likely less than 25 gallons per minute.
	Olentangy	Carbonaceous and sometimes arenaceous shale grading from massive to thinly laminated shale.	Little or no water is available from these formations.
	Delaware	Soft argillaceous shale with some argillaceous limestone concretions.	Small supplies of up to 3 gallons per minute may be developed.
	Columbus	Thin-bedded limestone with some thin shale layers, grading to rather massive layers of limestone.	Potential quantity of ground water available ranges up to 200 gallons per minute. Percentage of mineralization increases with depth of the specific well and location.
Silurian	Bass Island	Fairly massive and rather pure limestone grading to rather porous, massive, impure limestone.	This formation does not crop out in this basin, however, as much as 400 gallons per minute may be developed. The percent of mineralization increases with depth.

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M-3

