OHIO DEPARTMENT OF NATURAL RESOURCES, DIVISION OF WATER
1562 W. First Ave., Columbus 12, Ohio

OHIO WATER PLAN INVENTORY
1962

SANDUSKY RIVER BASIN
(Middle portion)

UNDERGROUND WATER RESOURCES

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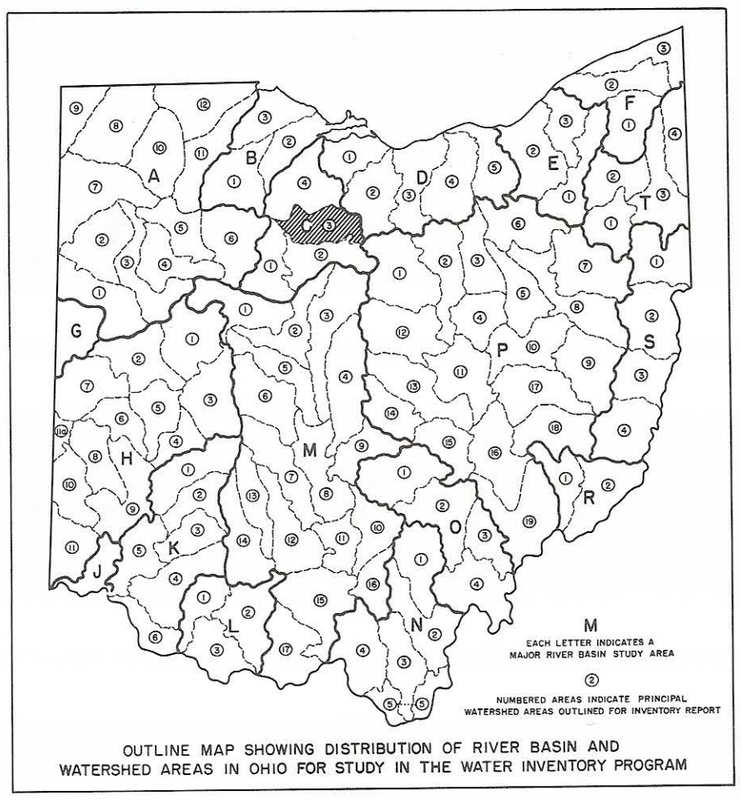
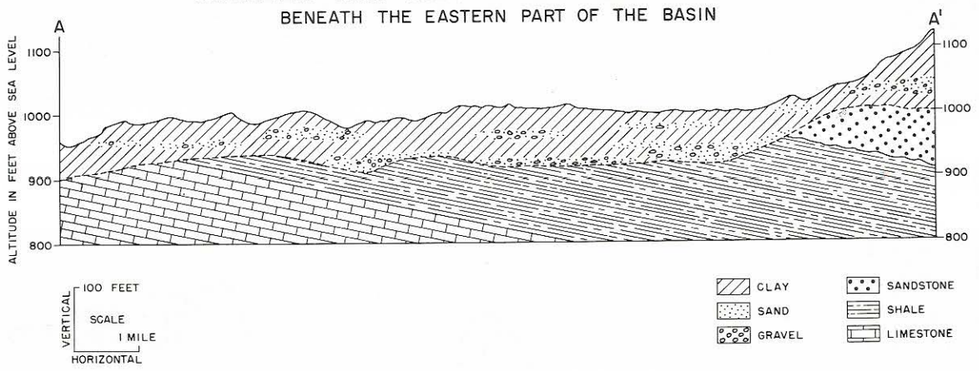
Ohio Division of Water



OUTLINE MAP SHOWING DISTRIBUTION OF RIVER BASIN AND WATERSHED AREAS IN OHIO FOR STUDY IN THE WATER INVENTORY PROGRAM

GENERALIZED CROSS SECTION SHOWING GEOLOGIC FORMATIONS BENEATH THE EASTERN PART OF THE BASIN



The occurrence of underground water is controlled, in part, by the kinds of rocks found at a given location. Openings or voids exist in practically all rock types in the form of joints, bedding planes, and solution channels of consolidated rock units, and between the individual grains or fragments of unconsolidated rock units. It is in these open spaces where underground water is stored. The size, shape, and number of openings and the degree in which they are interconnected, governs the amount of water available to wells.

The geologic formations of the basin area may be separated into two major divisions: (1) The bedrock comprises consolidated, sedimentary layers of limestone, dolomite, shale and sandstone. (2) The glacial deposits rest on top of the bedrock and consist of unconsolidated beds of clay, silt, sand, and gravel, occurring either in well sorted layers or as a heterogeneous mixture known as glacial till. The various rock formations in the basin and their water-bearing characteristics are described in the generalized stratigraphic sequence.

The glacial drift in the basin ranges from 15 to 135 feet in thickness. This material is composed predominantly of clay or a mixture of clay, sand, and gravel, and is generally a poor source of underground water. Glacial moraines adjacent to the north and south boundaries of the basin average over 50 feet thick and often contain scattered lenses of well sorted sand and gravel which yield adequate farm or domestic supplies. The majority of drilled wells in Chatfield, Cranberry, and Auburn townships, Crawford County, are developed in sand and gravel and yield from 5 to 40 gallons per minute.

Progressively younger bedrock formations occur near the surface from west to east across the basin. The cross section A-A' shows the approximate dip of the bedrock formations and illustrates the character of the overlying glacial deposits.

The bedrock in the western half of the basin comprises limestone and dolomite which are the principal water-bearing horizons of the area. The joints and fractures of these carbonate rocks are often enlarged by solution resulting in relatively high yields locally. However, the physical structure and chemical composition of these rocks are quite variable and yields may range from 10 to as much as 250 gallons per minute. The development of high yielding wells is often a matter of chance and usually requires extensive test drilling. Municipal and industrial wells may yield from 100 to 300 gallons per minute at depths of up to 300 feet. Farm or domestic supplies are readily available from limestone at depths of 50 to 150 feet.

Shale is the uppermost bedrock formation in the eastern part of the basin. Because the thin platey nature of shale blocks the movement of underground water, wells developed in the rock yield an average of less than 3 gallons per minute. In the upper few feet of the shale where weathering processes have fractured the strata, somewhat higher yields can be expected, but rarely over 5 gallons per minute. Deep wells drilled into the limestone beneath the shale are likely to produce highly mineralized water.

The Berea sandstone, which crops out in the extreme southeastern part of the basin, generally supplies from 5 to 25 gallons per minute at depths of up to 175 feet. Similar yields can be expected from the overlying glacial material when well sorted sand or gravel layers are encountered.

Records of approximately 600 water wells located within the basin are on file at the Ohio Division of Water. A number of typical wells are shown on the availability of ground-water map.

GENERALIZED STRATIGRAPHIC SEQUENCE OF THE ROCKS IN THE MIDDLE PORTION OF THE SANDUSKY 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 the principal streams.	Generally a poor source of water due to the predominance of fine material.
	Pleistocene		Relatively thick morainal deposits consisting of discontinuous sand or gravel layers interbedded in clay till.	Adequate supplies for farm or domestic use are usually available.
			Till, composed largely of clay with widely scattered lenses of sand or gravel.	Generally not a source of ground water although locally sand or gravel lenses yield small domestic supplies.
Mississippian		Berea	Thin-bedded to massive sandstone with some layers of sandy shale.	Farm or domestic supplies readily available. Wells seldom yield over 25 gallons per minute in the basin.
		Bedford	Soft, argillaceous shale.	Not a dependable source of ground water.
Devonian		Ohio	Hard, carbonaceous shale grading from massive to thinly laminated shale.	
		Olentangy	Soft argillaceous shale.	
		Delaware	Thin-bedded limestone with some thin shale layers.	Formation generally supplies less than 5 gallons per minute.
		Columbus	Massive, rather pure limestone.	Good ground-water source for farm, domestic, and limited industrial supplies. Water is sometimes charged with hydrogen sulfide.
Silurian		Bass Islands	Brown or gray massive to thin-bedded dolomites.	Dependable water source over large areas.
		Niagara	Brown to blue-gray crystalline dolomite.	Dependable water source. May be highly mineralized.

QUALITY OF UNDERGROUND WATER

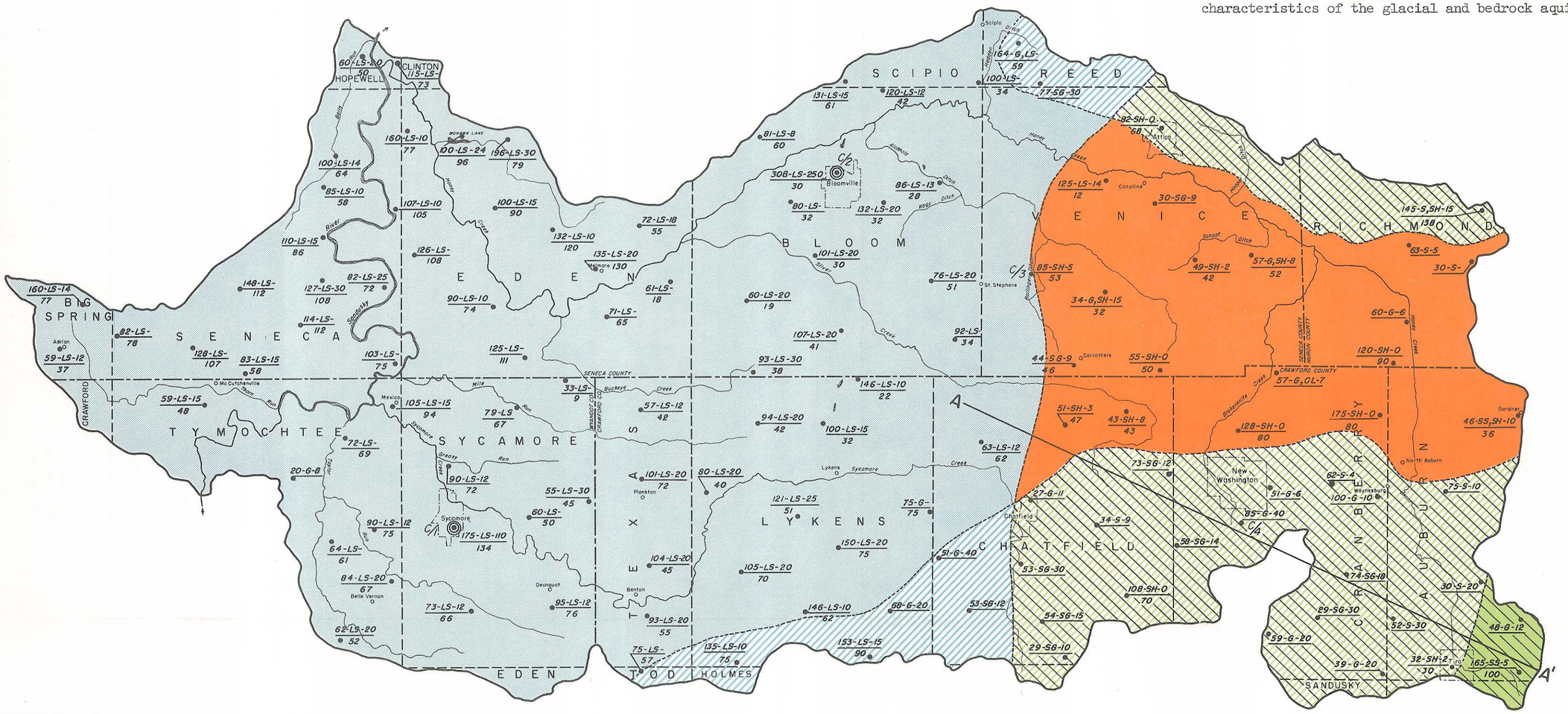
Partial analyses of water samples from four wells in the basin are shown in the following table. These wells are developed in limestone, shale, and gravel. Analyses were made by the Ohio Department of Health and the Quality of Water Branch, U.S. Geological Survey.

Well Number	C-1	C-2	C-3	C-4
Depth (ft.)	175	308	85	85
Water-bearing formation	Limestone	Limestone	Shale	Gravel
	Parts per million			
Iron (Fe)	1.2	.10	.45	.53
Chloride (Cl)	0.	12.	3.0	6.0
Dissolved solids	686.	515.	1920.	874.
Total hardness	528.	420.	1110.	562.
pH	7.3	7.2	7.4	7.3

Three of the samples contain iron in excess of 0.3 ppm, which is likely to stain laundry and porcelain plumbing fixtures. All samples have a rather high hardness and would normally require softening before being used.

Hydrogen sulfide is a common occurrence in ground water in the central and eastern part of the basin. Easily detected by an odor resembling rotten eggs, hydrogen sulfide can be removed by the use of chlorine or by aeration and filtratic

Note: This is a generalized map, showing the potential underground-water resources, based on data presently available. Detailed studies and exploratory drilling are needed to fully define the hydrologic characteristics of the glacial and bedrock aquifers.



LEGEND

AREAS IN WHICH YIELDS OF 100 TO 500 GALLONS PER MINUTE CAN BE DEVELOPED

Limestone, covered with an average of 50 feet of glacial till, supplies as much as 300 gallons per minute at depths of 150 to 300 feet.

Adequate farm or domestic supplies from sand and gravel layers in the glacial drift at depths of 40 to 90 feet. Larger yields available from the underlying limestone.

AREAS IN WHICH YIELDS OF 5 TO 25 GALLONS PER MINUTE CAN BE DEVELOPED

Glacial moraine deposits, underlain by shale, yield adequate farm and domestic supplies. Little or no water available from the bedrock.

Glacial moraine deposits, underlain by Berea sandstone, yield adequate farm and domestic supplies. Similar yields available from the underlying bedrock at depths of up to 175 feet.

AREAS IN WHICH YIELDS OF LESS THAN 5 GALLONS PER MINUTE CAN BE DEVELOPED

Thin to thick glacial drift composed predominantly of clay and overlying shale. Limited supplies are sometimes developed in the upper weathered portion of the bedrock. Cisterns and dug wells are common.

EXPLANATION OF SYMBOLS

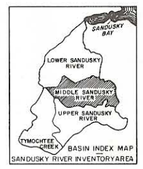
- • Domestic well
- ◉ Municipal well

S	Sand	LS	Limestone
G	Gravel	SH	Shale
CL	Clay	SS	Sandstone

C/2 Chemical analysis in text.

Total depth (Ft.) - Water-bearing formation - Yield (gpm)
Depth to bedrock (Ft.)

N



MAP OF THE MIDDLE PORTION OF THE
SANDUSKY RIVER BASIN
SHOWING
AVAILABILITY OF UNDERGROUND WATER

PUBLISHED BY - STATE OF OHIO, DEPARTMENT OF NATURAL RESOURCES, DIVISION OF WATER

SCALE IN MILES