GEOLOGICAL SURVEY CIRCULAR 299

PUBLIC AND INDUSTRIAL WATER SUPPLIES OF THE BLUE GRASS REGION, KENTUCKY

Prepared in cooperation with the Agricultural and Industrial Development Board of Kentucky.

UNITED STATES DEPARTMENT OF THE INTERIOR
Douglas McKay, Secretary

GEOLOGICAL SURVEY
W. E. Wrather, Director

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ABSTRACT

Data on the source, pumpage, treatment, and storage of water for 105 public and industrial water supplies in 43 counties in north-central Kentucky are presented. The topography ranges from gently rolling in the limestone areas to rugged and hilly in the shale areas, and major streams have cut deeply below the general upland level. The chief natural resources are a rich soil in the central part and abundant water supplies along the Ohio River. The principal industries are the production of distilled beverages, rubber, and chemicals, and tobacco and stock raising. The climate is of the humid continental type.

The region is astride the Cincinnati arch, a domed structure in rocks of Paleozoic age, chiefly limestones and shales. Quaternary unconsolidated sand and gravel deposits underlie the terraces along the Ohio River and some of the tributary streams.

The total daily pumpage of water is about 187 million gallons, of which approximately 148 million gallons is surface water and 39 million gallons is ground water. About 83 percent of the surface water is pumped from the Ohio River, and about 94 percent of the ground water is pumped from the alluvium along the Ohio River or from the bedrock which underlies the alluvium. Of the total daily pumpage, 56 percent is used for public supplies. The public supplies that were inventoried furnish water to about 867,000 people, about seven-tenths of the total population of the region and three-tenths of the population of the State. Public supplies obtained from surface-water sources serve about 846,000 people, and those from ground-water sources serve about 21,000.

The chief aquifers are limestone beds of Ordovician to Silurian age and unconsolidated alluvial deposits along the Ohio River. The limestone beds yield large supplies of water only where topography and drainage have been favorable to solutional enlargement of joints and openings along bedding planes. The alluvial deposits along the Ohio River yield large supplies of water in most places where the alluvium extends below stream level. These deposits yield 85 percent of the ground water used at present and are the only available source of very large supplies of ground water in the region.

Analyses of samples of 49 ground-water supplies indicate a wide range in quality. Nearly all samples of water were hard to very hard, and several contained objectionable amounts of iron. Two samples contained objectionable amounts of chloride. The hardest and most highly mineralized water came from the Ohio River alluvium.

INTRODUCTION

Purpose and Scope of Report

In order to provide data for planning intelligently the use and conservation of the water resources of Kentucky, ground-water investigations are being made by the United States Geological Survey in cooperation with the Agricultural and Industrial Development Board of Kentucky. This report is one of a series of five presenting data on the public and industrial water supplies of the State.

The area covered by this report includes 43 counties in the north-central part of the State (fig. 1). In this report the entire area is called the Blue Grass region although it extends beyond the limits of the Blue Grass as commonly defined. It comprises an area of about 11,300 square miles, or 26 percent of the State. In 1950 the total population was 1,273,576, or 43 percent of the total population of the State. The three largest cities of the State are in this region as defined.

This report presents information on the water supplies of 69 of the cities, larger towns, and some private institutions in the region, and of 36 industrial plants that have their own water supplies. With few exceptions, water supplies of less than 5,000 gpd have not been included. In 1951 the public supplies served a total population of about 867,000, about three-tenths of the population of the State. The report presents data on source, pumpage, treatment, and storage facilities at the water plants and chemical analyses of water from 49 ground-water installations.

Previous Investigations

This is the first detailed study of the public and industrial water supplies of the Blue Grass region. In 1909 G. C. Matson described the water resources of the region and included a list of earlier reports on the water resources of Kentucky. In 1950 D. K. Hamilton described the occurrence of ground water in Scott, Fayette, Jessamine, and Bourbon Counties of the Inner Blue Grass region, and 3 years later E. H. Walker published a preliminary study of the ground-water resources of the Covington-Newport alluvial area. Information about pumpage and quality of surface water for seven of the larger municipal supplies is included in a report by Lohr, Billingsley, Geurin, and Lamar (1952, pp. 21-35). Thorough

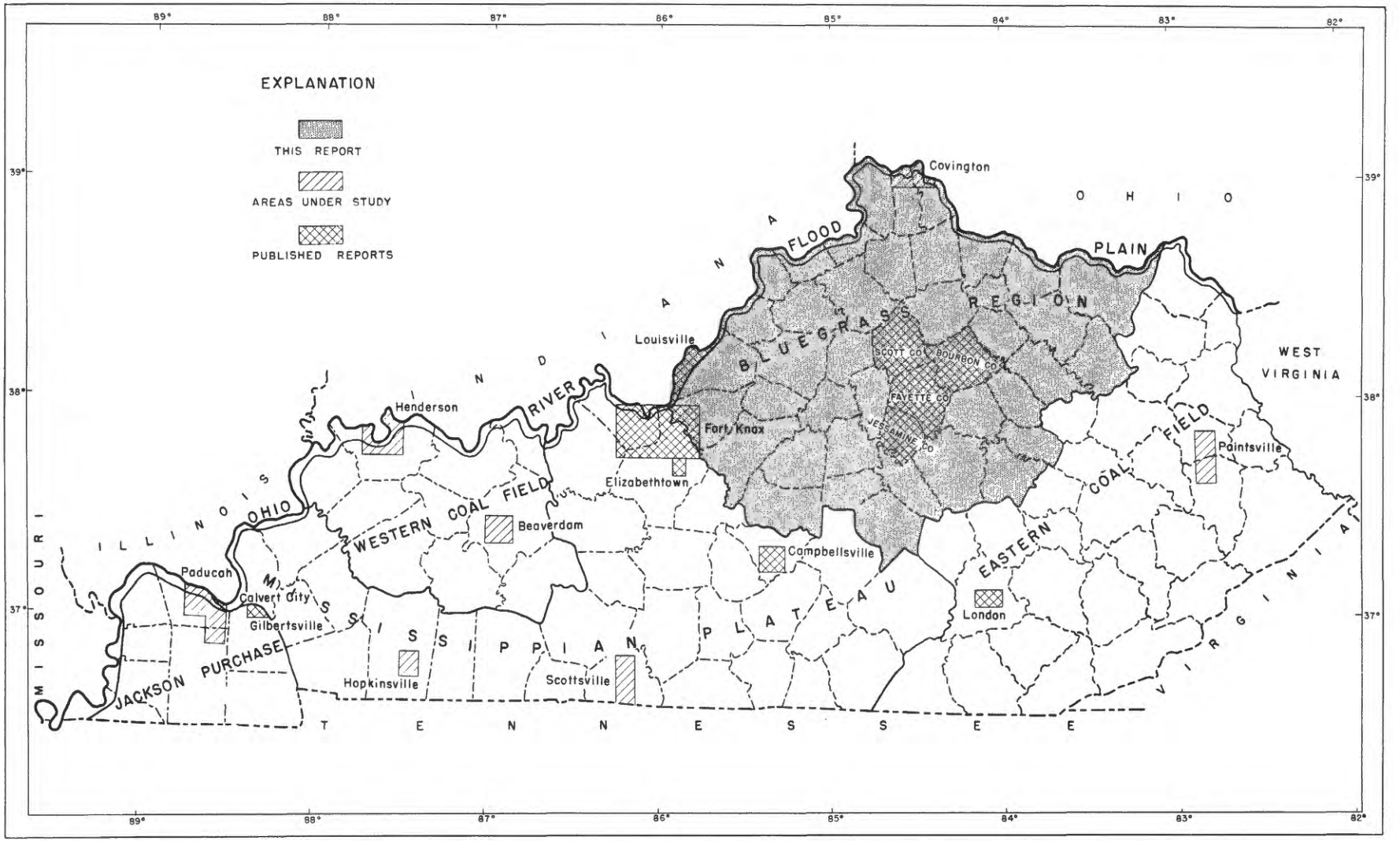

Figure 1. --Index map of Kentucky showing area of this report and progress of ground-water investigations

studies of the water resources of the Louisville area (Guyton, Stuart, and Maxey, 1944; Hamilton, 1944; Rorabaugh, 1946, 1948, 1949; Rorabaugh, Schrader, and Laird, 1953) are described in a series of reports completed since 1943. A list of these reports is found on page 101.

Methods of Investigation and Presentation of Data

The public and industrial water-supply installations described in this report were visited in 1951 and 1952 by the writers who obtained the information and collected the water samples. The samples were analyzed in the laboratory of the U. S. Geological Survey at Columbus, Ohio, under the direction of W. L. Lamar, district chemist.

An attempt was made to include all municipal supplies; other public supplies and industrial supplies were limited to those in excess of 5,000 gpd. Not enough information was available about some supplies for deriving a yearly or average daily pumpage figure. These instances are few, and the quantities concerned are generally small. The pumpage figures are mostly for 1950 or 1951. When a figure for an average year is given, it is based on 1945 to 1951 pumpage. No information on pumpage was available for a few supplies. The accuracy of the data obtained ranged from good to poor.

Inasmuch as ground-water supplies in the Louisville and Covington-Newport areas have been discussed in detail in earlier reports, data on these supplies are included here only in summary form.

Ground-water investigations are under the general direction of A. N. Sayre, chief, Ground Water Branch, and in Kentucky under the direction of M. I. Rorabaugh, district engineer, both of the U. S. Geological Survey. The information was gathered and the report was written under the supervision of E. H. Walker and G. E. Hendrickson, geologists.

Detailed information on each water supply is given under the heading "Descriptions and analyses" and is summarized in maps, figures, and tables accompanying this report. The pumpage is shown as the average number of gallons per day and gallons per year where this information was available. Where pumpage was seasonal or intermittent, the pumpage is shown in gallons per day for the period of pumping.

The sources of the water supplies included in this report are numbered to conform to the numbering system used by the Ground Water Branch throughout Kentucky. Under this system, the State has been divided into rectangles bounded by 5-minute meridians of longitude and 5-minute parallels of latitude. Each rectangle has been assigned a number based on the longitude and latitude at its southeast corner. Well 8445-3745-1, at Burgin, for example, is the first to have been enumerated in the rectangle bounded on the east by longitude 84°45' and on the south by latitude 37°45'. (See pl. 1.) Surface-water supplies are designated by town or institution names or, if industrial, by capital letter. For example, the surface-water supply of the Louisville & Nashville Railroad Co. at Ravenna is the first to have been enumerated in rectangle 8355-3740 and is designated by the letter "A." (See pl. 1.)

Acknowledgments

This report is based chiefly on information furnished by owners and operators of the public and industrial supplies, and could not have been prepared without the full cooperation of these officials. The Kentucky State Department of Health furnished information about the State institutions.

GEOGRAPHY

General Description

The Blue Grass region, as defined in this report, includes some areas not generally considered part of the Blue Grass region. They are included here for the convenience of drawing the regional boundary along county lines. The region is bounded on the east by the Eastern Coal Field, on the south and southwest by the Mississippian or Pennyroyal Plateau, on the northwest by the Ohio River and Indiana, and on the northeast by the Ohio River and Ohio. It comprises about 11,300 square miles, and in 1950 had a population of 1,273,576.

For the most part, the Blue Grass region is part of the Lexington Plain section of the Interior Low Plateaus. Streams such as the Ohio, Kentucky, and Licking Rivers are entrenched in its rolling uplands.

The region is drained entirely by the Ohio River and its tributaries, principally the Licking, Kentucky, Salt, Cumberland, and Green Rivers. The northward-flowing Licking River, which drains the eastern part of the region, joins the Ohio River between Covington and Newport. The Kentucky River drains the central part of the region and joins the Ohio River at Carrollton. The Salt River drains the western part of the region and joins the Ohio at West Point, south of Louisville. A small area in the southern part of the region is drained by the Cumberland and Green Rivers which flow into the Ohio near Paducah.

The Blue Grass region has a humid continental climate with marked contrast between winter and summer. The mean annual temperature is 54° to 55°F. The average temperature for the winter months, December, January, and February, ranges from 31° to 35°. The average annual minimum temperature at different places ranges from −5° to 0° and the average annual maximum temperature is about 100°. The growing season, or frost-free period, is about 180 days. Annual precipitation ranges from 40 to 50 inches and is usually distributed to provide sufficient rain during the growing season. Occasionally, there is too much rain, especially during the spring months, and drought conditions may prevail for a few weeks in the summer.

Figure 2. --Index map of the Blue Grass region showing ground-water areas and major structural features

Description of Areas

The Blue Grass region, as defined herein, can best be described as consisting of four areas of distinct topography and culture (fig. 2).

Area A comprises two separate and irregular parts that lie roughly in the middle of the Blue Grass region. It coincides for the most part with what is commonly known as the Inner Blue Grass and consists of the outcrop areas of the Cynthiana formation (Ordovician) and older Ordovician strata. The topography is gently rolling except along the major streams, which have entrenched themselves as much as 300 feet below the general land surface. Solution of the limestones that underlie the area has produced many sinkholes, and much of the drainage in the area is underground. In places the underground drainage comes to the surface to form large springs. The soils derived from the limestones are exceptionally fertile, providing high crop yields and allowing a great variety of crops. The chief crops are corn, tobacco, hay and forage, and wheat and oats. Very little wasteland is found. The region is famous for its production of thoroughbred horses. Living conditions are excellent and large farms are common. The chief industries are tobacco processing, stock raising, and the distillation of alcoholic beverages. The larger cities are Lexington, Frankfort, Versailles, Georgetown, Nicholasville, Danville, Paris, and Cynthiana.

Area B surrounds area A and ranges in width from 2 miles in the south to 70 miles in the north. Its inner part, which immediately surrounds area A, is deeply dissected and mature and lies at a greater altitude than area A, which has been lowered by solution. Toward its outer margin, area B is gently rolling. Area B is the outcrop area of limestones and shales of Late Ordovician age.

Narrow valleys and sharp, irregular ridges characterize the inner part of area B. Its steep slopes erode easily, and probably less than one-quarter of it can be cropped profitably and permanently (Davis, 1927). Its soil is poorer than that of the surrounding areas and the farms are smaller and not so prosperous. The gently rolling part of area B has a rich soil and large and prosperous farms. Its larger towns are Mount Sterling, Winchester, Richmond, Lancaster, Stanford, Harrodsburg, Springfield, Lawrenceburg, Shelbyville, and Eminence.

Area C is a belt of country adjacent to area B on the east, south, and west, in which Silurian, Devonian, Mississippian, and Pennsylvanian rocks crop out. It is in general an area of rolling to rugged hills with some broad, flat lowlands. The rolling areas support large productive farms. In the lowland areas and rugged hills the farms are generally smaller and less prosperous. The larger towns are Morehead, Irvine, Lebanon, Bardstown, and La Grange.

Area D consists of the alluvial terraces of the Ohio River along the northern border of the State. The width of this area of terraces on the Kentucky side of the river ranges from almost nothing in a number of places to a maximum of about 5 miles near Louisville. The river terraces are relatively flat and are the sites of large cities and large, prosperous farms. Much of the industry and population of Kentucky is concentrated in the cities along the river: Maysville, Newport, Covington, Carrollton, and Louisville.

Mineral Resources

The mineral resources of the Blue Grass region are many and varied, but only the limestone and clay deposits are of major economic importance at present.

Limestone that is suitable for building stone, road metal, railroad ballast, lime, agricultural limestone, and portland cement is quarried in most parts of the region, but most large commercial quarries are in area A. Clay, used for common brick and drain tile, is produced in Marion, Jessamine, Fayette, Jefferson, Mason, Madison, Nelson, and Powell Counties. Molding sand has been obtained from river deposits on the upland of northern Kenton County. Gravel and building sand are obtained from the alluvial deposits of the Ohio River, especially in Campbell, Gallatin, Carroll, and Jefferson Counties.

Coal is mined from the Pennsylvanian rocks on a small scale and mostly for local consumption in a few of the eastern counties on the edge of the Eastern Coal Field. Oil and gas is obtained from Silurian and Devonian rocks in a number of pools in Estill and Powell Counties. Oil shales of the Devonian, undeveloped at present, offer a potential of more petroleum products than have ever been produced by drilling in Kentucky (McFarlan, 1943, pp. 385-386).

Small deposits of fluorspar, barite, galena, sphalerite, and calcite occur in veins in central Kentucky and some of these have been mined. Their occurrence is limited mainly to Woodford, Fayette, Jessamine, Lincoln, Bourbon, Scott, Boyle, and Garrard Counties. Iron ore in the form of oolitic carbonate, oolitic hematite, and siderite concretions has been mined in the Blue Grass region in the past, but the workings have been abandoned.

Brines are not being developed at present in the Blue Grass region. In the past they were developed commercially in Kenton, Boone, Nicholas, Henry, Bullitt, and Jefferson Counties. Generally the Kentucky brines are quite dilute as compared to other commercial brines.

GEOLOGY

Stratigraphy

The Blue Grass region is underlain by consolidated sedimentary rocks that range in age from Ordovician to Pennsylvanian. Quaternary alluvial deposits occur in the stream valleys. Table 1 is a generalized geologic section and a brief summary of the ground-water characteristics of the different rock units. The oldest Ordovician rocks exposed at the surface are those of the Highbridge group. They crop out in southern Jessamine County and elsewhere in the gorge of the Kentucky River where it is deeply entrenched across the Cincinnati arch. Composed of magnesian and lithographic limestone in beds ranging from a few inches to a few feet in thickness, they produce water only where exposed at the surface to direct infiltration.

The Middle Ordovician rocks, including the Lexington group and the Cynthiana formation, are composed of thin- to medium-bedded limestones, with shale partings and interbedded shales. The outcrop area of these rocks is coextensive with area A. In some places solutionally enlarged cavities in these rocks yield enough water for small municipal and industrial supplies.

The Upper Ordovician rocks, including the Eden formation and the Maysville and Richmond groups, form a belt 2 to 70 miles wide around area A. The outcrop area of these rocks constitutes area B. The Eden formation is a series of blue shales, with interbedded limestone, and yields very little water to wells. It forms the inner part of the roughly circular belt. The Maysville and Richmond groups are composed of thin to medium beds of limestone and shale which crop out beyond the Eden shale. Where the thicker limestone beds occur at or near the surface, they may produce small quantities of water.

The outcrop areas of Silurian, Devonian, Mississippian, and Pennsylvanian rocks constitute area C.

Table 1.--Generalized section of the geologic formations exposed or penetrated by wells in the Blue Grass region, Ky.

Era	System	Series	Formation or group	Thickness (feet)	Area	Lithology	Water-bearing characteristics
Cenozoic	Quaternary	Pleistocene and Recent	Alluvium	0-175	D	Clay, silt, sand, and gravel.	Low yields from clay and silt. Yields 200-300 gpm, in places 1,000 gpm, to wells from sand and gravel. Water is very hard and high in content of dissolved solids.
Paleozoic	Pennsylvanian		Pottsville	245-490	C	Sandstone conglomerate, and shale.	Yields enough fresh water for domestic use in its outcrop area, at depths as much as 200 ft.
	Mississippian			900		Massive limestones, sandstones, and shales.	Yields 200 gpm to one spring in limestone. Water is comparatively soft. Probably low yields from shales.
	Devonian			350		Black shale and thick limestones at base.	Low yields and poor quality from shales. Yields 200-300 gpm to wells from limestone below glacial deposits in Louisville area. Water is hard to very hard and high in content of dissolved solids.
	Silurian			180		Shales and limestones.	Moderate yields to springs in limestones. Low yields in shales.
	Ordovician	Upper	Richmond	200-300	B	Thin to thick limestones and shales.	Generally low yields. Several 35-gpm wells reported. Water is hard to very hard.
			Maysville	195-235			
			Eden	175-260		Shale and thin limestones.	Very low yields.
		Middle	Cynthiana	40-150	A	Shaly limestones.	Yields generally less than 50 gpm to wells. Yields 375 gpm to one well and 300 gpm to one spring. Water is hard to very hard but comparatively low in content of dissolved solids.
			Lexington	135-140		Thick limestone, some shale.	
			Highbridge	400-425		Thick limestones.	Little information. Yields 225 gpm to one well. Water is very hard.
			St. Peter	-	-	Sandy dolomite.	Yields quantities of salt-sulfur water.

The Silurian and Devonian rocks crop out in two narrow bands, one near the eastern and the other near the western border of the Blue Grass region. They consist of more or less massive limestones and shales. In their outcrop area in Nelson County the Silurian rocks yield small quantities of water to springs. In the Louisville area the Silurian and Devonian rocks underlying the glacial outwash along the Ohio River yield enough water for industrial use.

Limestones and shales of Mississippian age and sandstones and shales of Pennsylvanian age crop out in small patches along the eastern, southern, and western boundaries of the region. Limestones of Mississippian age yield water for a few small public supplies in the eastern part of the region.

Alluvial deposits lie along the streams in the Blue Grass region. Along the Ohio River in area D, these deposits reach a maximum thickness of about 175 feet and consist of unconsolidated sediments ranging from coarse gravel to clay. The coarse material is found in the lower part, and the silt and clay form a cover. In places the alluvium extends as much as 70 feet below pool level of the river and yields large amounts of water. The alluvium in streams tributary to the Ohio River is generally much finer grained and not so thick as that along the Ohio and generally does not yield enough water for large municipal or industrial supplies.

Structure

The major structural feature of the Blue Grass region is the Cincinnati arch. The axis of the arch trends north-northeastward from where the arch enters the region in Boyle County to the center of the region where it splits. One branch passes out of the area in Boone County to the northwest, and the other in Pendleton County to the north. In Jessamine County, in area A, a domed structure has developed on the axis of the arch from which the rocks dip 20 to 40 feet per mile on the east and west and about 10 feet per mile on the north and south (McFarlan, 1943, p. 132). Erosion subsequent to the arching has exposed the oldest rocks in the center and progressively younger rocks outward in concentric belts.

A number of fault systems also have contributed to the present topography. The Kentucky River fault is a zone of echelon faults which, within the region, extends from Marion and Lincoln Counties northeastward to Montgomery County. The relation of the Kentucky River to the fault is shown along the Clark-Madison County line where the river changes its northwestward course abruptly to southwestward as it intersects the fault zone, and then follows the fault zone southwestward for about 15 miles before resuming its previous northwest direction. The West Hickman (Lexington-Maysville) fault zone extends from Maysville in Mason County southwestward to terminate at the Kentucky River fault (McFarlan, 1943, pp. 145-150).

WATER RESOURCES

Utilization

The pumpage of ground and surface water for both public and industrial use is shown in tables 2, 3, and 4, figure 3, and plate 1. The pumpage has been summarized in average daily figures based on the total yearly pumpage when this information was available, and in daily pumpage figures while the plants were in operation when the pumpage period was unknown or was less than a year. A part of the water distributed through public-supply systems is used for various industrial purposes, especially in the larger cities, but data are not available to show the exact amount.

The total average daily pumpage for the supplies described in this report amounts to about 187 million gallons, of which 104 million gallons, or about 56 percent, is used for public supplies, and the remaining 83 million gallons, 44 percent, is used for industrial purposes. The total average daily pumpage is distributed in the four areas as follows: area A, 10 percent; area B, 3 percent; area C, 2 percent; and area D, 85 percent. About 79 percent of the pumpage for public usage and 94 percent of the pumpage for industrial usage is in area D.

In the Louisville area and vicinity the pumpage of ground water in 1951 averaged 32.347 mgd. All but 0.242 mgd of this amount is for industrial purposes. In the Covington-Newport area the daily pumpage of ground water for industrial use was 3.7 mgd. The usage by the various types of industries in these areas is given under "Descriptions and analyses."

Outside the Louisville and Covington-Newport areas, the total average pumpage of both ground and surface water for industrial purposes is 5.3 mgd. Of this, 4.1 mgd is used for distilling, 1 mgd is used for railroads, and 0.2 mgd is used for washing sand and gravel.

Quality of Water

This report includes 49 complete chemical analyses of ground water made by the U. S. Geological Survey. These are tabulated with other descriptive material under "Descriptions and analyses." The results of analyses of the dissolved substances in these samples are given in parts per million by weight. These figures can be converted to grains per gallon by multiplying by 0.0584.

The dominant ionic constituents in natural waters are calcium, magnesium, sodium, potassium, bicarbonate (also carbonate in some), sulfate, and chloride. Small quantities of nitrate and fluoride also are present in some ground waters. The ions of calcium,

Table 2.--Pumpage and source of ground water for public and industrial supplies in the Blue Grass region, Ky.

County	City	Industry or institution	Population served	Water-bearing strata and pumpage in gallons per day			
				Alluvium	Mississippian-Silurian	Upper Ordovician	Middle Ordovician
Anderson	Lawrenceburg	Hoffman Distilling Co.	-	-	-	U	U
Do.	McBrayer	The Calvert Distilling Co.	-	-	-	-	S 212,000
Do.	do.	The Old Joe Distillery Co.	-	-	-	-	U
Boyle	Perryville	-	700	-	-	-	12,000
Bracken	Augusta	-	1,602	U	-	-	-
Bullitt	Limestone Springs	The Geo. T. Stagg Co., Schenley Distillers, Inc.	-	-	U	-	-
Campbell	Covington-Newport area	Combined supplies	-	3,700,000	-	-	-
Do.	Silver Grove	-	784	(1)	-	-	-
Do.	do.	Chesapeake & Ohio Ry. Co.	-	643,000	-	-	-
Do.	do.	St. Anne Convent	100	20,000	-	-	-
Carroll	Carrollton	-	3,316	295,000	-	-	-
Do.	do.	Blue Ribbon Distillery, Schenley Distillers, Inc.	-	U	-	-	-
Do.	do.	C and M Sand Co.	-	95,000	-	-	-
Do.	do.	Carrollton Gravel and Sand Co., Inc.	-	56,000	-	-	-
Franklin	Frankfort	The Benson Creek Distillery Co.	-	-	-	-	144,000
Do.	do.	Old Grand-Dad Distillery, National Distillers Products Corp.	-	-	-	-	S 663,000
Gallatin	Warsaw	-	900	40,000	-	-	-
Do.	do.	Gallatin Sand & Gravel Co.	-	28,000	-	-	-
Harrison	Lair	Carstairs Bros. Distilling Co., Inc.; Joseph E. Seagram & Sons, Inc.	-	-	-	-	U
Jefferson	Louisville area	Combined supplies	-	27,965,000	3,859,000	-	-
Do.	Southwest Jefferson County	do.	-	542,000	5,000	-	-
Jessamine	Camp Nelson	Kentucky River Distillery, Inc.	-	-	-	-	U
Do.	Nicholasville	-	3,454	-	-	-	250,000
Kenton	Covington-Newport area	Combined supplies	-	(2)	-	-	-
Lewis	Vanceburg	-	1,000	37,000	-	-	-
Marion	Bradfordsville	-	350	8,000	-	-	-
Mercer	Burgin	-	700	-	-	-	52,000
Nelson	Bardstown	Barton Distilling Co.	-	-	A,S 10,000	-	-
Do.	do.	Waterfill & Frazier Distillery Co.	-	-	U	-	-
Do.	do.	The Willett Distilling Co.	-	-	U	-	-
Do.	Bloomfield	-	825	-	-	40,000	-
Do.	Deatsville	T. W. Samuels Distillery	-	-	U	-	-
Do.	Fairfield	Julius Kessler Distilling Co., Joseph E. Seagram & Sons, Inc.	-	-	-	U	-
Do.	Greenbrier	Double Springs Distillers, Inc.	-	-	A,S 50,000	-	-
Pendleton	Butler	-	350	-	-	-	10,000
Powell	-	Natural Bridge State Park	200	-	3,000	-	-
Do.	Stanton	-	412	7,000	-	-	-
Scott	Georgetown	-	5,465	-	-	-	411,000
Do.	do.	Cardome School	150	-	-	U	-
Do.	Stamping Ground	The Geo. T. Stagg Co., Schenley Distillers, Inc.	-	-	-	-	U
Do.	White Sulphur	Julius Kessler Distilling Co., Joseph E. Seagram & Sons, Inc.	-	-	-	-	U
Woodford	Glenns Creek Station	Old Crow Distillery and Old Taylor Distillery, National Distillers Products Corp., Frankfort	-	-	-	-	S 101,000
Do.	Midway	Kentucky Female Orphanage	270	-	-	-	55,000
Do.	do.	Park & Tilford Distillers Corp.	-	-	-	-	U
Do.	Millville	Labrot & Graham Distillery, Brown-Forman Distillers Corp.	-	-	-	-	A,S 10,000
Total			20,628	33,436,000	3,927,000	40,000	1,920,000

(1) From C & O Ry. Co. (2) See Campbell County.

Table 3.--Pumpage of surface water for public and industrial supplies in the Blue Grass region, Ky.

County	City	Industry or institution	Population served	Pumpage in gallons per day
Anderson	Lawrenceburg	-	3,079	274,000
Do.	do.	Hoffman Distilling Co.	-	U
Do.	McBrayer	The Calvert Distilling Co.	-	G 534,000
Do.	-	The Old Joe Distillery Co.	-	U
Do.	Stringtown	-	100	(1)
Do.	Tyrone	Anderson County Distilling Co.	-	A 576,000
Bath	Owingsville	-	820	49,000
Boone	Walton	-	1,390	65,000
Bourbon	Millersburg	-	1,000	22,000
Do.	North Middletown	-	525	25,000
Do.	Paris	-	6,901	919,000
Boyle	Danville	-	9,849	989,000
Do.	Houstonvills	-	400	(2)
Do.	Junction City	-	800	(2)
Do.	Morsland	-	500	(2)
Do.	Shelby City	-	-	(2)
Do.	-	Kentucky State Mental Hospital	1,700	287,000
Bracken	Brooksville	-	264	U
Bullitt	Clermont	James B. Beam Distilling Co.	-	A 60,000
Do.	Lebanon Junction	-	1,263	40,000
Do.	Limestone Springs	The Geo. T. Stagg Co., Schenley Distillers, Inc.	-	U
Do.	Shepardsville	-	825	75,000
Campbell	Alexandria	-	640	61,000
Do.	Cold Springs	St. Joseph Orphanage	135	8,000
Do.	Newport	-	31,015	5,141,000
Do.	Fort Thomas	-	10,830	(3)
Do.	Other cities	-	17,979	(4)
Clark	Winchester	-	11,157	845,000
Estill	Irvine	-	3,259	291,000
Do.	Ravenna	-	979	(5)
Do.	do.	Louisvills & Nashville R. R. Co.	-	384,000
Fayette	Lexington	-	80,000	8,530,000
Fleming	Flemingsburg	-	1,400	82,000
Franklin	Frankfort	-	15,449	2,577,000
Do.	do.	Old Grand-Dad Distillery, National Distillers Products Corp.	-	G 757,000
Do.	do.	The Geo. T. Stagg Co., Schenlsy Distillers, Inc.	-	U
Garrard	Lancaster	-	2,394	75,000
Grant	Dry Ridge	-	400	(6)
Do.	Williamstown	-	1,463	117,000
Harrison	Cynthiana	-	4,832	466,000
Do.	Lair	Carstairs Bros. Distilling Co., Inc., Joseph E. Seagram & Sons, Inc.	-	U
Henry	Campbellsburg	-	500	U
Do.	Eminence	-	1,456	104,000
Do.	Newcastle	-	750	(7)
Jefferson	Louisville	-	450,000	63,603,000
Do.	do.	Combined industrial supplies	-	41,150,000
Jessamine	Camp Nelson	Kentucky River Distillery, Inc.	-	9,000
Do.	Wilmore	-	2,431	106,000
Kenton	Covington	-	64,282	11,976,000
Do.	Other cities	-	33,942	(3)
Lincoln	Crab Orchard	-	500	14,000
do.	Stanford	-	1,885	140,000
Madison	Berea	-	3,800	363,000
do.	Richmond	-	10,717	899,000
do.	do.	Blue Grass Ordnance Depot	2,500	164,000
Marion	Dant	The Dant Distillery Co.	-	A 50,000
do.	Lebanon	-	4,643	513,000
Mason	Maysville	-	14,500	977,000
Mercer	Burgin	Blue Ribbon Distillery, Schenlsy Distillers, Inc.	-	A 250,000
do.	Harrodsburg	-	5,239	273,000
Montgomery	Mount Sterling	-	5,800	411,000
Nelson	Bardstown	-	4,185	350,000
do.	do.	Barton Distilling Co.	-	A,G 1,190,000
do.	do.	Glencoe Distilling Co.	-	A 100,000
do.	do.	Heaven Hill Distillsries, Inc.	-	A 120,000
do.	do.	Nazareth College and Academy	450	U
do.	do.	The Geo. T. Stagg Co., Schenley Distillers, Inc.	-	U
do.	do.	Waterfill & Frazier Distillery Co.	-	U
do.	do.	The Willett Distilling Co.	-	A 165,000
do.	Boston	Barton Warehouse & Distillery Corp.	-	A 250,000
do.	Deatsville	T. W. Samuels Distillsry	-	A 179,000
do.	Fairfield	Julius Kessler Distilling Co., Joseph E. Seagram & Sons, Inc.	-	A 144,000
do.	Gethsemane	The Dant Distillery Co., United Distillers of America, Inc.	-	A 200,000
do.	Greenbriar	Double Springs Distillers, Inc.	-	A,G 950,000
do.	New Haven	-	950	9,000
do.	Trappist	Abbey of Gethsemane	300	50,000
Nicholas	Carlisle	-	1,750	79,000
Oldham	La Grange	-	2,000	60,000
do.	do.	Kentucky State Reformatory	2,200	583,000
Owen	Owenton	-	1,298	82,000
Pendleton	Falmouth	-	2,907	400,000
Rowan	Morehead	-	2,850	241,000
Scott	Sadieville	-	650	U
do.	Stamping Ground	-	400	U
do.	do.	The Geo. T. Stagg Co., Schenlsy Distillers, Inc.	-	U
Shelby	Shelbyvills	-	4,395	396,000
do.	do.	Kentucky State Woman's Prison	75	18,000
Spencer	Taylorsville	-	950	60,000
Washington	Springfield	-	2,822	158,000
Woodford	Glens Creek Station	Old Crow Distillery and Old Taylor Distillery, National Distillers Products Corp., Frankfort	-	G 1,763,000
	Midway	-	900	38,000
do.	do.	Park & Tilford Distillers Corp.	-	U
do.	Millville	Labrot & Graham Division, Brown-Forman Distillers Corp.	-	A,G 20,000
do.	Versailles	-	3,055	190,000
Total			846,430	152,046,000

(1) From Lawrenceburg. (2) From Danville. (3) From Covington. (4) From Newport. (5) From Irvine. (6) From Williamstown. (7) From Eminence.

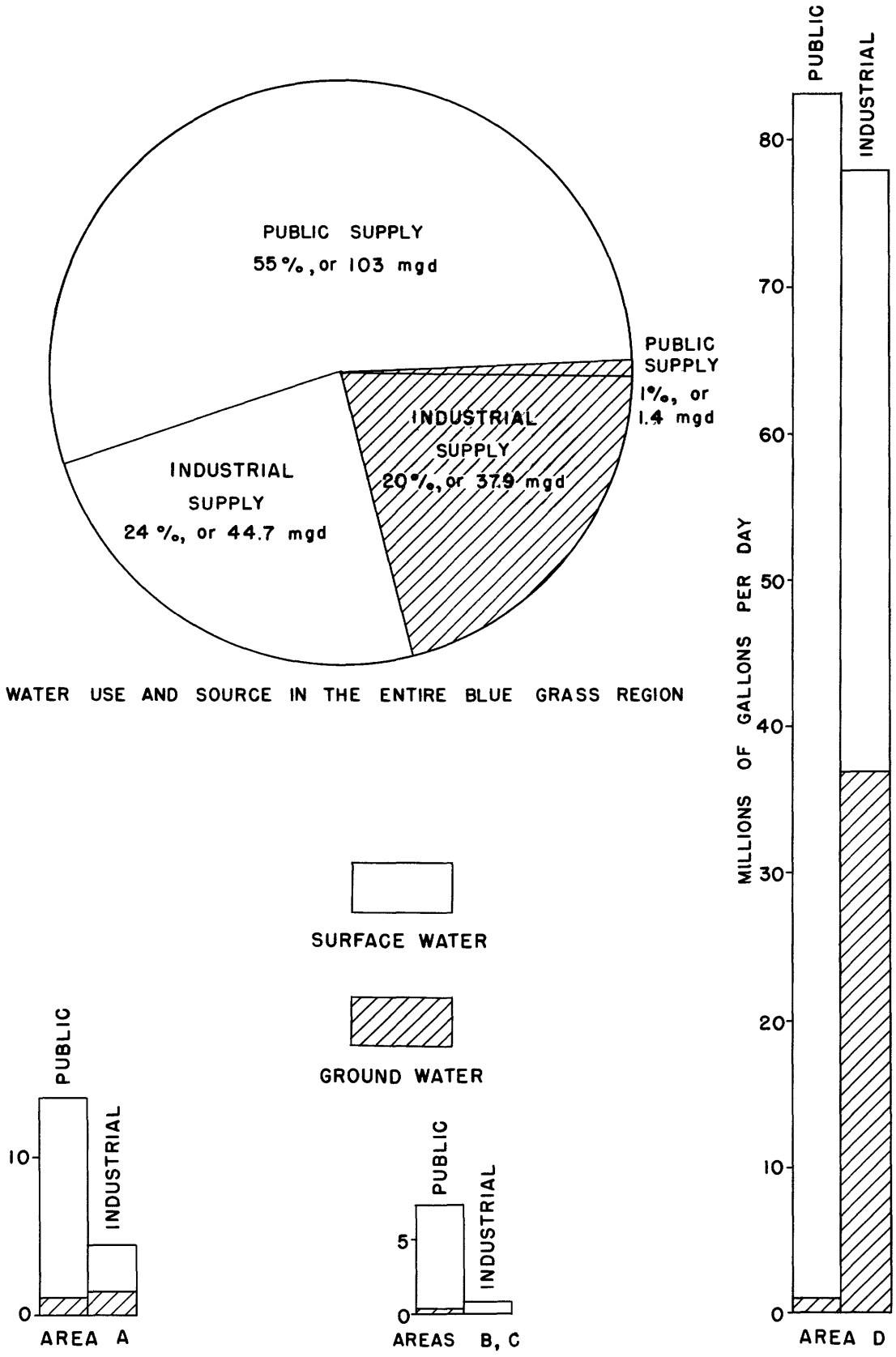

Figure 3.--Water use and source, in millions of gallons per day, in the Blue Grass region, Ky.

Table 4.--Average daily pumpage of water for public and industrial supplies by areas in the Blue Grass region, Kentucky

[Thousands of gallons per day]

Usage and source	Area A	Area B	Area C	Area D	Total Blue Grass region
Public use:					
Surface water	14,149	4,688	2,497	81,697	103,031
Ground water	738	40	18	634	1,430
Total	14,887	4,728	2,515	82,331	104,461
Industrial use:					
Surface water	3,063	164	384	41,150	44,761
Ground water	1,182	—	60	36,651	37,893
Total	4,245	164	444	77,801	82,654
Combined use:					
Surface water	17,212	4,852	2,881	122,847	147,792
Ground water	1,920	40	78	37,285	39,323
Total	19,132	4,892	2,959	160,132	187,115

magnesium, sodium, and potassium are called cations, or metallic ions, and sometimes are referred to loosely as bases or basic radicals. These cations have one or two positive electrical charges. The ions of bicarbonate (and carbonate when present), sulfate, chloride, nitrate, and fluoride are called anions, and sometimes are referred to as acid radicals. These anions have one or two negative charges.

The cations and anions will combine to form chemical compounds such as sodium chloride, which is common salt. However, in parts per million this combination does not take place unit for unit, because 22.997 ppm of sodium will combine exactly with 35.457 ppm of chloride. In order to express chemical combinations, as well as to show water analyses graphically as on plate 2, the quantities may be expressed in equivalents per million. Parts per million may be converted to equivalents per million by dividing the parts per million by the combining weight of the constituent. Thus, for example, a unit equivalent of the cation sodium will combine exactly with a unit equivalent of the anion chloride to form the compound sodium chloride.

When parts per million are converted to equivalents per million, the sum of all the cations (bases) should equal the sum of all the anions within limits of practical analytical procedure, inasmuch as these ions are in equilibrium. In the graphic plots on plate 2, the left-hand column of cations and the right-hand column of anions are of the same height. In these diagrams, the cations are shown in the following order, from the bottom to the top: calcium, magnesium, sodium, and potassium; the anions are in the same order: bicarbonate (including carbonate), sulfate, and chloride (including fluoride and nitrate). When the nitrate content is more than 10 ppm, it is shown separately, in solid black, at the tip of the column. The total hardness of a water as calcium carbonate, in parts per million, is shown by a figure at the top of the magnesium block, because the hardness of water in this region is due mainly to the calcium and magnesium content.

The hydrogen-ion concentration, of which pH is a measure, is useful in determining the scale-forming or corrosive tendencies of the water. The pH of neutral water is 7.0. Decreasing values of pH denote increasing hydrogen-ion concentrations; increasing values of pH denote decreasing hydrogen-ion concentration. Thus, when the pH is lower than 7.0 the water is acid; when it is higher than 7.0 the water is alkaline.

The specific conductance of a water is a measure of the ability of the water to conduct an electric current. This property is of no consequence in itself concerning treatment of water. The conductivity test, however, is important as an indication of the amount of dissolved solids in the water. It provides a convenient means of indicating changes in concentration, but it is not considered a reliable check on the accuracy of the analyses.

The dissolved-solids content represents the quantity of substances in solution, though the value reported may include some organic matter and water of crystallization. The United States Public Health Service recommends that the total solids of a potable water supply be limited to 500 ppm (1,000 ppm permitted where necessary).

Hard water is usually recognized by the large amount of soap required to produce lather and by the scum of insoluble salts formed when the water is heated. Hardness is due chiefly to the salts of calcium and magnesium, although aluminum, iron, manganese, and free acid can contribute to it. The hardness caused by calcium and magnesium equivalent to the bicarbonate or carbonate or both in a water is called carbonate hardness; the hardness caused by other compounds of calcium and magnesium is called noncarbonate hardness. In this report, waters having a hardness in the range from 0 to 60 ppm are considered soft; those between 61 and 120 ppm are moderately hard; those between 121 and 200 ppm are hard; and those above 200 ppm are very hard.

Table 5.--Elements and substances commonly found in ground water

Constituent	Source	Significance
Silica (SiO_2)	Siliceous minerals present in essentially all formations.	Forms hard scale in pipes and boilers. Inhibits deterioration of zeolite-type water softeners.
Iron (Fe)	The common iron-bearing minerals present in most formations.	Oxidizes to a reddish-brown sediment. More than about 0.3 ppm stains laundry and utensils reddish brown, is objectionable for food processing, beverages. Larger quantities impart taste and favor the growth of iron bacteria.
Manganese (Mn)	Manganese-bearing minerals.	Rarer than iron; in general has same objectionable features; brown to black stain.
Calcium (Ca) and magnesium (Mg)	Minerals that form limestone and dolomite and occur in some amount in almost all formations. Gypsum also a common source of calcium.	Cause most of the hardness and scale-forming properties of water; soap consuming.
Sodium (Na) and potassium (K)	Feldspars and other common minerals; ancient brines, sea water; industrial brines and sewage.	In large amounts give salty taste; objectionable for specialized industrial water uses.
Bicarbonate (HCO_3) and carbonate (CO_3)	Action of carbon dioxide in water on carbonate minerals.	In combination with calcium and magnesium forms carbonate hardness which decomposes in boiling water with attendant formation of scale and release of corrosive carbon dioxide gas.
Sulfate (SO_4)	Gypsum, iron sulfides, and other rarer minerals, common in waters from coal-mining operations and many industrial wastes.	Sulfates of calcium and magnesium give bad taste, form hard scale.
Chloride (Cl)	Found in small to large amounts in all soils and rocks; natural and artificial brines, sea water, sewage.	In large enough amounts gives salty taste; objectionable for various specialized industrial uses of water.
Fluoride (F)	Various minerals of widespread occurrence, in minute amounts.	In water consumed by children, about 1.5 ppm and more may cause mottling of the enamel of teeth; about 1.0 ppm seems to reduce decay of teeth.
Nitrate (NO_3)	Decayed organic matter, sewage, nitrate fertilizers, nitrates in soil.	Values higher than the local average may suggest pollution. There is evidence that more than about 45 ppm NO_3 may cause methemoglobinemia ("blue baby") of infants, sometimes fatal; waters of high nitrate content should not be used for baby feeding.

The significance of the various mineral constituents in solution is indicated in table 5.

Surface Water

About 148 mgd is pumped from surface-water sources in the entire Blue Grass region for public and industrial use. This is about 80 percent of the total amount pumped from both surface and ground-water sources.

The surface-water sources in the Blue Grass are of two major types: those pumped from streams and those pumped from impounding structures. The larger city supplies, such as those at Louisville and Covington which pump from the Ohio River, and Frankfort which pumps from the Kentucky River, and many others which pump from smaller streams, are examples of the first type. The second type is exemplified at Alexandria in Campbell County and Owenton in Owen County. In these places, the existing streams did not provide enough water in periods of low stage and had to be dammed to provide storage.

Ground Water

About 39 mgd is pumped from ground-water sources in the entire Blue Grass region for public and industrial use. Of this about 37 mgd, or about 94 percent of the total, is pumped from the unconsolidated alluvial deposits and underlying bedrock along the Ohio River.

Area A

Area A consists of the outcrop areas of the limestones of the Highbridge and Lexington groups and the Cynthiana formation.

The limestones of the Highbridge group, exposed in the gorge of the Kentucky River in southern Jessamine County, are the source of only one water supply described in this report. The Kentucky River Distillery, Inc., at Camp Nelson has two wells with reported yields of 225 and 100 gpm. These are probably exceptionally high yields for aquifers of this

group and are due, in part, to their nearness to the Kentucky River and the zone of large solution openings related to the drainage. The water from well 8435-3745-16 is very hard, having a total hardness of 264 ppm. Dissolved solids totaled 307 ppm. (See pl. 2.)

A number of public and industrial supplies obtain their water from limestone of the Lexington group and Cynthiana formation. The city of Nicholasville, Jessamine County, obtains water from 10 wells which yield an average of about 60 gpm each. The city of Georgetown in Scott County uses a spring which furnishes water for about 5,500 persons. The Calvert Distilling Co. at McBrayer, Anderson County, has 3 wells with a total yield of about 300 gpm. At Burgin, Mercer County, the city water supply has been developed from a well in limestone which yields as much as 375 gpm. This supply is exceptional, for the well is a large rectangular concrete structure which taps a large solution cavity. A single drilled well at Versailles, Woodford County, yields about 200 gpm. The yields from springs range greatly. Some small springs go dry in summer, whereas the large spring at Georgetown yields more than 400,000 gpd even in dry weather.

The water from the limestones of the Lexington group and Cynthiana formation is hard to very hard but low in content of dissolved solids. The hardness and dissolved solids of water from springs are generally less than that of water from wells. Almost half the 23 samples from area A contained objectionable amounts of iron.

Area B

Area B consists of the outcrop areas of the Eden formation and Maysville and Richmond groups. The Eden formation is composed of shale and thin limestones and does not yield enough water for industrial or public use. It does supply small amounts of water for domestic and farm use from dug wells through the mantle of soil and weathered rock to and into the bedrock. The yield of these wells usually diminishes to almost nothing during the summer dry season.

The Maysville and Richmond groups are composed of shales and thin- to medium-bedded limestones and a few massive limestone layers. Where the fractures in the thicker limestones have been enlarged by solution, usually near the surface, they yield small to moderate quantities of water. At Bloomfield, Nelson County, the city supply comes from four wells in the Maysville group, each yielding 35 gpm, with a total daily average pumpage of 40,000 gallons.

No samples of water from the Eden formation were analyzed. Of the 4 samples of water from the Maysville and Richmond groups, 2 were similar to the water of the limestones of the Lexington group and the Cynthiana formation, but the other 2 were of much poorer quality. Both samples of poorer quality contained more than 700 ppm of dissolved solids, and one of them contained 308 ppm of chloride and 1.8 ppm of fluoride.

Area C

Area C includes the outcrop areas of Silurian, Devonian, Mississippian, and some Pennsylvanian rocks. The rocks of Silurian, Devonian, and Mississippian age consist of medium- to thick-bedded limestone, sandstone, and shale; Pennsylvanian rocks are chiefly sandstone, shale, and conglomerate. Where the Silurian limestones are at the surface, springs are common. The existence of these springs has determined the sites of many of the distilleries for which Kentucky is famous. None of these springs yields a large amount of water, the highest yield reported being 15 gpm. In the Louisville area about 3.9 mgd is pumped from limestones of Silurian and Devonian age beneath the alluvial sand and gravel. Outside the Louisville area only one supply is derived from wells in the Silurian rocks, and none from wells in the Devonian or Pennsylvanian rocks. Two supplies are from springs in the sandstones and limestones of Mississippian age. The spring supplying water for the Natural Bridge State Park in Powell County yields about 100 gpm from Mississippian rocks.

Six analyses of water from springs in the Silurian rocks show hard to very hard water which contains 0.14 to 0.88 ppm of iron. The water from one well in the Silurian rocks was similar to the spring water but contained 3.3 ppm of iron.

Two samples of water from springs in the Mississippian rocks were comparatively soft, and the analyses showed no iron. The sample from the spring at Natural Bridge State Park was softer (38 ppm) and contained smaller amounts of dissolved solids (52 ppm) than any other ground-water sample analyzed for this study.

Area D

Area D is the Kentucky part of the Ohio River alluvial terraces. The alluvium in this area now yields about 33 mgd, or 85 percent of the water pumped from ground-water sources in the Blue Grass area. Most of this pumpage is at present concentrated in the industrial areas of Louisville, Covington, and Newport, but large supplies in the alluvium in other places are available for future development.

The yield of individual wells in the alluvium in the Louisville area is as great as 1,500 gpm. Alluvium along the Ohio River is the only known potential source of large public and industrial supplies of ground water in the Blue Grass region. The alluvial deposits in valleys of streams tributary to the Ohio River are finer grained and less permeable than those along the Ohio River, and only three of the public and industrial supplies obtain their water from these deposits.

The water in the alluvium along the Ohio River is generally harder and more highly mineralized than the water in the other aquifers in the Blue Grass

region. Ten samples of water from that alluvium were analyzed for this report. Only three of these had a total hardness of less than 300 ppm. One sample from Vanceburg, Lewis County, contained 720 ppm of chloride and 81 ppm of sulfate and had a total hardness of 850 ppm. Two samples of water from the alluvium along streams tributary to the Ohio River were generally similar in quality to the water in the alluvium along that river, but the sample from Stanton, Powell County, had a hardness of only 60 ppm.

DESCRIPTIONS AND ANALYSES

The following descriptions and analyses include the detailed information gathered on the water supply of each city, town, institution, or industry, arranged alphabetically by county and within each county alphabetically by city or town. Where available, complete information was gathered, but not all communities, institutions, and industries have kept records. The material is listed according to the following plan:

1. Name of county.

2. Name of city or town, or nearest city or town; and name of institution or industry, if not a municipal supply.

3. Population served: For cities and towns, this is the population or an estimate of consumers based on the number of meters. For institutions, this is the average number of residents.

4. Ownership: In most cases this is the ownership of the waterworks. When the source and plant are owned separately, the ownership of each is given.

5. Source: For ground water: indentification number and location, depth, diameter, date drilled, water-bearing stratum, "static" (nonpumping) water level, and yield of wells; for surface water: name of stream or type of reservoir, identification number and letter, and location.

6. Treatment: Description of treatment, and location of treatment plant when not at the source.

7. Capacity: For surface-water supplies this is the rated capacity of the filters in gallons per day.

8. Storage: Capacity and location of storage reservoirs, elevated tanks, and standpipes for finished water.

9. Total distribution of water: The total amount of water pumped for 1951, or other year or average year. In some cases this figure is based on an average daily pumpage. When available, pumpage by months and maximum and minimum monthly pumpages are given.

10. Breakdown of annual distribution as to use: This is available only for some of the larger municipal supplies.

11. Average daily pumpage: In most cases this figure is based on the yearly pumpage divided by 365. When pumpage was intermittent or seasonal, the figure given is for daily pumpage while in operation.

12. Regular determinations at treatment plant: These figures are given only when supplied by the waterworks officials from their own records.

13. Analyses: Chemical analyses of ground water made by the U. S. Geological Survey.

14. The 43 counties covered by this report are as follows:

Anderson	Garrard	Nelson
Bath	Grant	Nicholas
Boone	Harrison	Oldham
Bourbon	Henry	Owen
Boyle	Jefferson	Pendleton
Bracken	Jessamine	Powell
Bullitt	Kenton	Robertson
Campbell	Lewis	Rowan
Carroll	Lincoln	Scott
Clark	Madison	Shelby
Estill	Marion	Spencer
Fayette	Mason	Trimble
Fleming	Mercer	Washington
Franklin	Montgomery	Woodford
Gallatin		

At the time this investigation was made (1951-52), there were no large public or industrial water supplies in Trimble and Robertson Counties.

ANDERSON COUNTY

Lawrenceburg

Population served: 3,079, Stringtown 100, total 3,179.
Ownership: Municipal.
Source: Impounding reservoir in the Salt River, 4 miles south of town. A new filter plant is planned for the near future, using the Kentucky River, 3 miles to the east, as a source of supply.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Copper sulfate is used for algae control in summer. Fluorine will be added to the water when the new plant is in operation.
Capacity: 350,000 gpd. Will be increased to 700,000 gpd when new plant is in operation.
Storage: 185,000 gal in 3 elevated tanks, 1 in the east central part and 2 in the northern part of town.
Total distribution of water for 1950: 100,000,000 gal.
Maximum monthly ..... August ..... 12,500,000 gal
Minimum monthly ..... February ..... 8,000,000 gal
Average daily pumpage, 1950: 274,000 gal.

Lawrenceburg, Hoffman Distilling Co.

Ownership: Hoffman Distilling Co.
Source: Two wells and Hammonds Creek, 8455-3800-A, 6 miles west of town on Kentucky Highway 44.
Well 8455-3800-1. Depth, 75 ft; diameter, 6 in.; date drilled, 1936; water-bearing stratum, Upper or Middle Ordovician rocks; static water level, 16 ft below land surface.
Well 8455-3800-2. Depth, 100 ft; diameter, 6 in.; date drilled, about 1940; water-bearing stratum, Upper or Middle Ordovician rocks.
Treatment: Commercial boiler-water treatment.

Analysis, in parts per million, well 8455-3800-1

(Collected Feb. 13, 1952.)

Silica (SiO_2)	7.4	Fluoride (F)	0.4
Iron (Fe)	.19	Nitrate (NO_3)	1.7
Manganese (Mn)	.00	Dissolved solids	376
Calcium (Ca)	96	Hardness as $CaCO_3$	
Magnesium (Mg)	16	Total	304
Sodium (Na)	16	Noncarbonate	60
Potassium (K)	2.7	Temperature (°F)	56
Bicarbonate (HCO_3)	299	pH	7.9
Sulfate (SO_4)	69	Specific conductance at 25°C (micromhos)	606
Chloride (Cl)	19		

McBrayer, The Calvert Distilling Co.

Ownership: The Calvert Distilling Co.
Source: Three wells and Salt River, 8450-3755-A.
Well 8450-3755-1. Depth, 125 ft; diameter, 8 in.; water-bearing stratum, Middle Ordovician rocks.
Well 8450-3755-2. Depth, 125 ft; water-bearing stratum, Middle Ordovician rocks
Well 8450-3755-3. Depth, 67 ft; diameter, 8 in.; water-bearing stratum, Middle Ordovician rocks; static water level, 26.35 ft below land surface on March 6, 1937.
Treatment: Commercial boiler-water treatment.
Total distribution of water for average year: 272,250,000 gal.
Average daily pumpage: 746,000 gal.
From wells ..... 212,000 gal.
From surface ..... 534,000 gal.

Analysis, in parts per million, well 8450-3755-1

(Collected Feb. 13, 1952.)

Silica (SiO_2)	8.9	Fluoride (F)	0.4
Iron (Fe)	1.6	Nitrate (NO_3)	2.3
Manganese (Mn)	.48	Dissolved solids	340
Calcium (Ca)	90	Hardness as $CaCO_3$	
Magnesium (Mg)	14	Total	282
Sodium (Na)	16	Noncarbonate	31
Potassium (K)	2.2	Temperature (°F)	58
Bicarbonate (HCO_3)	307	pH	7.3
Sulfate (SO_4)	37	Specific conductance at 25°C (micromhos)	572
Chloride (Cl)	17		

McBrayer, The Old Joe Distillery Co.

Ownership: The Old Joe Distillery Co.
Source: One well and Salt River, 8450-3755-B.
Well 8450-3755-4. Depth, 125 ft; diameter, 6 in.; date drilled, about 1940; water-bearing stratum, Middle Ordovician rocks.
Storage: 2,500 gal.

Analysis, in parts per million, well 8450-3755-4

(Collected Feb. 13, 1952.)

Silica (SiO_2)	8.0	Fluoride (F)	0.3
Iron (Fe)	.11	Nitrate (NO_3)	4.7
Manganese (Mn)	.41	Dissolved solids	308
Calcium (Ca)	93	Hardness as $CaCO_3$	
Magnesium (Mg)	8.3	Total	266
Sodium (Na)	7.4	Noncarbonate	35
Potassium (K)	1.5	Temperature (°F)	56
Bicarbonate (HCO_3)	282	pH	8.1
Sulfate (SO_4)	36	Specific conductance at 25°C (micromhos)	508
Chloride (Cl)	6.5		

Tyrone, Anderson County Distilling Co.

Ownership: Anderson County Distilling Co.
Source: Kentucky River, 8450-3800-A.
Treatment: Commercial boiler-water treatment.
Storage: 7,000 gal.
Average daily pumpage, when in operation: 576,000 gal.

BATH COUNTY

Owingsville

Population served: 820.
Ownership: Municipal.
Source: Slate Creek, 1 1/2 miles southeast of town.
Treatment: Coagulation with alum and lime, chlorination, and rapid sand filtration. Treatment plant is located on southeast edge of town.
Storage: 22,000 gal in elevated tank near center of town.
Total distribution of water for average year: 18,000,000 gal.
Maximum monthly ..... September ..... 2,000,000 gal.
Minimum monthly ..... June ..... 1,500,000 gal.
Average daily pumpage: 49,000 gal.

BOONE COUNTY

Walton

Population served: 1,390.
Ownership: Municipal.
Source: Impounding reservoir partially fed by springs, 1 mile southwest of town.
Treatment: Coagulation with alum and lime, chlorination, and rapid sand filtration. Treatment plant is at the reservoir.
Capacity: 360,000 gpd.
Storage: 100,000 gal in elevated tank in the south part of town.
Total distribution of water for average year: 23,700,000 gal.
Maximum monthly ..... August ..... 2,500,000 gal.
Minimum monthly ..... December ..... 1,860,000 gal.
Average daily pumpage: 65,000 gal.

Regular determinations at treatment plant, 1951

Determinations	Finished water		
	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	80	88	76
pH	7.8	8.0	7.4
Hardness as $CaCO_3$ (ppm)	144	-	-

BOURBON COUNTY

Millersburg

Population served: 1,000.
Ownership: Municipal.
Source: Dam on Hinkston Creek at east edge of town.
Treatment: Coagulation with alum and lime, and chlorination. Plant is at the east edge of town.
Storage: 55,000 gal in elevated tank.
Total distribution of water for average year: 8,000,000 gal.
Maximum monthly ..... October ..... 750,000 gal.
Minimum monthly ..... July ..... 600,000 gal.
Average daily pumpage: 22,000 gal.

North Middletown

Population served: 525.
Ownership: Municipal.
Source: Dam on Stoner Creek, 1 mile west of town.
Treatment: Coagulation with alum and lime, chlorination, and rapid sand filtration. Treatment plant is at the dam.
Capacity: 187,000 gpd.
Storage: 100,000 gal in elevated tank.
Total distribution of water for average year: 9,000,000 gal.
Maximum monthly ..... July ..... 900,000 gal.
Minimum monthly ..... December ..... 600,000 gal.
Average daily pumpage: 25,000 gal.

Paris

Population served: 6,901.
Ownership: Municipal.
Source: Dam on Stoner Creek on the east edge of town. Two dams, 8 miles upstream on Stoner Creek, provide an auxiliary source.
Treatment: Coagulation with alum and lime, prechlorination, activated carbon to remove tastes and odors, settlement, rapid sand filtration, and postchlorination. Treatment plant is located at the pumping plant at the dam.
Capacity: 1,500,000 gpd.
Storage: 800,000 gal in two standpipes, one on the northwest edge and the other on the south edge of town.
Total distribution of water for 1950: 335,680,000 gal.
Maximum monthly ..... December ..... 31,040,000 gal.
Minimum monthly ..... February ..... 24,500,000 gal.
Average daily pumpage: 919,000 gal.

Regular determinations at treatment plant, 1950

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
pH	7.6	8.4	7.0	7.2	8.4	6.8
Turbidity	73	1,500	35	-	-	-

BOYLE COUNTY

Danville

Population served: 9,849, Junction City 800, Moreland 500, Houstonville 400, Shelby City ?, total 11,549.
Ownership: Municipal.
Source: Herrington Lake, 4 miles northeast of town.
Treatment: Prechlorination, coagulation with alum and lime, settlement, rapid sand filtration, and postchlorination. Filter plant is located half a mile northeast of town.
Capacity: 1,500,000 gpd.
Storage: 350,000 gal in two elevated tanks, one at the plant and the other on the west side of town.
Total distribution of water for 1951: 361,074,523 gal.
Maximum monthly ..... August ..... 33,781,678 gal.
Minimum monthly ..... February ..... 25,501,320 gal.
Average daily pumpage: 989,000 gal.

Regular determinations at treatment plant, 1950

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	96	130	80	100	130	80
pH	7.3	7.5	7.0	7.8	8.0	7.6
Hardness as $CaCO_3$ (ppm)	-	-	-	112	140	100
Turbidity	25	3,500	20	-	-	-
Temperature (°F)	50	70	32	-	-	-

Average pumpage, in gallons per day, 1951

January	910,800	May	975,800	September	1,036,700
February	910,800	June	980,000	October	1,061,000
March	930,100	July	1,023,400	November	1,030,900
April	909,900	August	1,089,700	December	1,004,200

Kentucky State Mental Hospital

Population served: 1,700.
Ownership: Kentucky State Mental Hospital, Commonwealth of Kentucky, near Danville, Kentucky.
Source: Herrington Lake, 6 miles north of Danville on Kentucky Highway 33.
Treatment: Prechlorination, coagulation with alum and lime, rapid sand filtration, activated carbon, and postchlorination.
Capacity: 350,000 gpd.
Storage: 130,000 gal in clear well and elevated tank.
Total distribution of water for 1951: 104,700,000 gal.
Maximum monthly ..... August ..... 11,998,000 gal.
Minimum monthly ..... June ..... 6,895,000 gal.
Average daily pumpage: 287,000 gal.

Regular determinations at treatment plant, 1951

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
pH	7.4	9.8	7.2	7.8	8.4	7.2

Perryville

Population served: 700.
Ownership: Municipal.
Source: Two wells on First Street.
Well 8455-3735-1. Depth, 96 ft; diameter, 6 in.; date drilled, 1949; water-bearing stratum, Middle Ordovician rocks; static water level, 60 ft below land surface on October 3, 1951; yield, 50 gpm; specific capacity, 8.3 gpm after 54 hr pumping; used as stand-by well.
Well 8455-3735-2. Depth, 92 ft; diameter, 6 in.; date drilled, 1949; water-bearing stratum, Middle Ordovician rocks; static water level, 60 ft below land surface on October 3, 1951; yield, 50 gpm; specific capacity, 8.3 gpm after 54 hr pumping.
Treatment: Chlorination.
Storage: 50,000 gal in elevated tank, 1 block south of Fourth Street.
Total distribution of water for average year: 4,380,000 gal.
Average daily pumpage: 12,000 gal.

Analysis, in parts per million, well 8455-3735-2

(Collected Oct. 3, 1951.)

Silica (SiO_2)	8.1	Fluoride (F)	0.1
Iron (Fe)	.20	Nitrate (NO_3)	4.1
Manganese (Mn)	.00	Dissolved solids	458
Calcium (Ca)	117	Hardness as $CaCO_3$	
Magnesium (Mg)	17	Total	360
Sodium (Na)	20	Noncarbonate	64
Potassium (K)	7.7	Temperature (°F)	69
Bicarbonate (HCO_3)	364	pH	7.3
Sulfate (SO_4)	73	Specific conductance at 25°C (micromhos)	712
Chloride (Cl)	30		

BRACKEN COUNTY

Augusta

Population served: 1,602.
Ownership: Municipal.
Source: Two wells on the east edge of town near the Chesapeake & Ohio railroad tracks.
Well 8355-3845-1. Depth, 98 ft; diameter, 8 in.; date drilled, 1948; water-bearing stratum, Quaternary alluvium; yield, 500 gpm.
Well 8355-3845-2. Depth, 96 ft; diameter, 6 in.; date drilled, 1948; water-bearing stratum, Quaternary alluvium; yield, 150 gpm.
Treatment: None.
Storage: 50,000 gal in elevated tank.

Analysis, in parts per million, well 8355-3845-1

(Collected July 18, 1951.)

Silica (SiO_2)	12	Fluoride (F)	0.0
Iron (Fe)	.56	Nitrate (NO_3)	11
Manganese (Mn)	-	Dissolved solids	475
Calcium (Ca)	126	Hardness as $CaCO_3$	
Magnesium (Mg)	12	Total	366
Sodium (Na)	5.3	Noncarbonate	26
Potassium (K)	3.6	Temperature (°F)	56
Bicarbonate (HCO_3)	412	pH	7.0
Sulfate (SO_4)	34	Specific conductance at 25°C (micromhos)	695
Chloride (Cl)	4.5		

Brooksville

Population served: 264.
Ownership: Municipal.
Source: Impounding reservoir, 2 1/2 miles southeast of town.
Treatment: Coagulation with alum and lime, chlorination, activated charcoal, and rapid sand filtration. Plant is located at the source.
Storage: Elevated tank in center of town.

BULLITT COUNTY

Clermont, James B. Beam Distilling Co.

Ownership: James B. Beam Distilling Co.
Source: Two impounding reservoirs, 8535-3755-A, one at plant and one eight-tenths of a mile north of plant.
Treatment: Chlorination, alum, and activated charcoal.
Storage: 30,000 gal.
Average daily pumpage, when in operation: 60,000 gal.

Lebanon Junction

Population served: 1,263.
Ownership: Municipal.
Source: Rolling Fork River, 1 mile southeast of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination.
Capacity: 168,000 gpd.
Storage: 100,000 gal in elevated tank.
Total distribution of water for average year: 14,500,000 gal.
Average daily pumpage: 40,000 gal.

Limestone Springs, The Geo. T. Stagg Co.

Ownership: The Geo. T. Stagg Co., Schenley Distillers, Inc.
Source: Spring 8535-3755-1 and impounding reservoir 8540-3755-A.
Treatment: Commercial boiler-water treatment.
Storage: 132,000 gal.

Shepardsville

Population served: 825.
Ownership: Municipal.
Source: Salt River, south edge of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Copper sulfate is used for algae control in summer. Plant is located at the source.
Capacity: 216,000 gpd.
Storage: 35,000 gal in elevated tank on northwest edge of town.
Total distribution of water for average year: 27,375,000 gal.
Average daily pumpage: 75,000 gal.

CAMPBELL COUNTY

Alexandria

Population served: 640.
Ownership: Municipal.
Source: Impounding reservoir, 1 mile east of town.
Treatment: Coagulation with alum and lime, chlorination, and rapid sand filtration. Plant is located at the source.
Capacity: 1,000,000 gpd.
Storage: Total 80,000 gal; 30,000 in clear well at the plant and 50,000 in elevated tank in the south central part of town.
Total distribution of water for 1951: 22,340,000 gal.
Average daily pumpage, 1951: 61,000 gal.

Regular determinations at treatment plant, 1951

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
pH	8.4	9.0	7.8	8.2	8.4	7.6
Hardness as $CaCO_3$ (ppm)	150	160	140	140	150	120

Cold Springs, St. Joseph Orphanage

Population served: 135.
Ownership: St. Joseph Orphanage.
Source: Impounding reservoir.
Treatment: Chlorination. Copper sulfate is used for algae control in summer.
Storage: 75,000 gal in elevated tank.
Total distribution of water for 1951: 3,120,000 gal.
Maximum monthly ..... 360,000 gal.
Minimum monthly ..... 120,000 gal.
Average daily pumpage: 8,000 gal.

Newport

Population served: 31,015, Bellevue 9,036, Dayton 8,943, total 48,994.
Ownership: Municipal.
Source: Ohio River, 3 miles east of town.
Treatment: Coagulation with alum and lime, chlorination, and rapid sand filtration. Plant is located 2 miles east of town on Water Works Road.
Capacity: 6,000,000 gpd.
Storage: 40,000,000 gal in two open reservoirs at plant.
Total distribution of water for 1951: 1,876,290,000 gal.
Maximum monthly ..... July ..... 177,000,000 gal.
Minimum monthly ..... January ..... 139,840,000 gal.
Average daily pumpage: 5,141,000 gal.

Regular determinations at treatment plant, 1950

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	39	44	36	38	40	36
pH	7.8	8.0	7.5	7.7	8.0	7.5
Hardness as $CaCO_3$ (ppm)	-	132	126	-	-	-
Turbidity	286	600	120	-	-	-
Temperature (°F)	46	76	24	-	-	-

Average pumpage, in gallons per day, 1951

January	4,511,000	May	5,439,400	September	5,435,000
February	5,295,700	June	5,686,700	October	5,121,300
March	4,698,700	July	5,709,700	November	4,810,000
April	4,705,300	August	5,666,500	December	4,624,500

Silver Grove, Chesapeake & Ohio Railway Co.

Ownership: Chesapeake & Ohio Railway Co.
Source: Three wells.
Well 8420-3900-26. Depth, 98 ft; diameter, 18 in.; date drilled, November 1940; water-bearing stratum, Quaternary alluvium; static water level, 43.9 ft below land surface on January 30, 1941; yield, 1,040 gpm; specific capacity 79.3 gpm.
Well 8420-3900-27. Depth, 100 ft; diameter, 18 in.; date drilled, July 1944; water-bearing stratum, Quaternary alluvium; static water level, 46.5 ft below land surface on November 3, 1944; yield, 600 gpm; specific capacity 92.3 gpm.
Well 8420-3900-28. Depth, 101 ft; diameter, 18 in.; date drilled, January 1951; water-bearing stratum, Quaternary alluvium; static water level, 45 ft below land surface in January 1951; yield, 1,000 gpm; specific capacity, 73.5 gpm.
Treatment: Coagulation with alum and lime, and a commercial boiler-water treatment.
Storage: 900,000 gal in elevated tanks.
Total distribution of water for 1950: 234,899,800 gal.
Maximum monthly ..... December ..... 22,841,900 gal.
Minimum monthly ..... February ..... 11,136,900 gal.
Breakdown of annual distribution as to use:
Domestic (Silver Grove) ..... 11,508,550 gal.
Industrial and commercial ..... 223,391,250 gal.
Average daily pumpage, 1950: 643,000 gal.

Analysis, in parts per million, well 8420-3900-28

(Collected Aug. 16, 1951.)

Silica (SiO_2)	15	Fluoride (F)	0.1
Iron (Fe)	6.0	Nitrate (NO_3)	.2
Manganese (Mn)	1.4	Dissolved solids	404
Calcium (Ca)	93	Hardness as $CaCO_3$	
Magnesium (Mg)	18	Total	308
Sodium (Na)	20	Noncarbonate	41
Potassium (K)	2.6	Temperature (°F)	56
Bicarbonate (HCO_3)	324	pH	7.5
Sulfate (SO_4)	66	Specific conductance at	
Chloride (Cl)	14	25°C (micromhos)	653

Silver Grove, St. Anne Convent

Population served: 60-150
Ownership: St. Anne Convent.
Source: Two wells.
Well 8420-3900-2. Depth, 200 ft; diameter, 8 in.; date drilled, 1913; water-bearing stratum, Quaternary alluvium.
Well 8420-3900-33. Depth, 200 ft; diameter, 8 in.; date drilled, 1913; water-bearing stratum, Quaternary alluvium.
Treatment: Zeolite softening process.
Storage: 20,000 gal in elevated tank.
Total distribution of water for average year: 7,300,000 gal.
Average daily pumpage: 20,000 gal.

Analysis, in parts per million, well 8420-3900-2

(Collected Jan. 17, 1952.)

Silica (SiO_2)	14	Fluoride (F)	0.1
Iron (Fe)	.05	Nitrate (NO_3)	3.2
Manganese (Mn)	.47	Dissolved solids	373
Calcium (Ca)	102	Hardness as $CaCO_3$	
Magnesium (Mg)	16	Total	322
Sodium (Na)	6.8	Noncarbonate	55
Potassium (K)	1.0	Temperature (°F)	56
Bicarbonate (HCO_3)	324	pH	7.3
Sulfate (SO_4)	44	Specific conductance at 25°C (micromhos)	611
Chloride (Cl)	16		

Carrollton

Population served: 3,316.
Ownership: Kentucky Water Service Co., Inc., Somerset, Kentucky.
Source: Three wells.
Well 8510-3840-1. Depth, 110 ft; diameter, 10 in.; date drilled, May 29, 1950; water-bearing stratum, Quaternary alluvium; static water level, 59 ft below land surface on May 29, 1950; yield, 528 gpm; specific capacity, 58.7 gpm; used as auxiliary supply.
Well 8510-3840-4. Depth, 157.6 ft; diameter, 10 in.; date drilled, 1898; water-bearing stratum, Quaternary alluvium; yield, 528 gpm; specific capacity, 31 gpm after 96 hr pumping.
Well 8510-3840-10. Depth, 104 ft; diameter, 10 in.; date drilled, September 1951; water-bearing stratum, Quaternary alluvium; yield, 500 gpm; specific capacity, 38.5 gpm.
Treatment: Chlorination. Plant at Fifth and Polk Streets.
Storage: 200,000 gal in covered surface reservoirs on hill in southeast corner of town.
Total distribution of water for year, September 1950 to August 1951: 107,705,000 gal.
Maximum monthly ..... August ..... 12,000,000 gal.
Minimum monthly ..... October ..... 6,660,000 gal.
Breakdown of annual distribution as to use:
Domestic ..... 28,850,000 gal.
Industrial and commercial ..... 39,460,000 gal.
Other public uses ..... 28,624,500 gal.
Leakage and waste ..... 10,770,500 gal.
Average daily pumpage: 295,000 gal.

Analysis, in parts per million, well 8510-3840-1

(Collected July 18, 1951.)

Silica (SiO_2)	20	Fluoride (F)	0.2
Iron (Fe)	.18	Nitrate (NO_3)	36
Manganese (Mn)	-	Dissolved solids	458
Calcium (Ca)	100	Hardness as $CaCO_3$	
Magnesium (Mg)	30	Total	372
Sodium (Na)	15	Noncarbonate	79
Potassium (K)	2.9	Temperature (°F)	57
Bicarbonate (HCO_3)	359	pH	7.4
Sulfate (SO_4)	68	Specific conductance at 25°C (micromhos)	748
Chloride (Cl)	13		

Analysis, in parts per million, well 8510-3840-4

(Collected July 19, 1951.)

Silica (SiO_2)	14	Fluoride (F)	0.1
Iron (Fe)	.08	Nitrate (NO_3)	11
Manganese (Mn)	-	Dissolved solids	418
Calcium (Ca)	99	Hardness as $CaCO_3$	
Magnesium (Mg)	24	Total	346
Sodium (Na)	13	Noncarbonate	49
Potassium (K)	3.9	Temperature (°F)	57
Bicarbonate (HCO_3)	362	pH	7.3
Sulfate (SO_4)	54	Specific conductance at 25°C (micromhos)	710
Chloride (Cl)	8.5		

Carrollton, Blue Ribbon Distillery

Ownership: Blue Ribbon Distillery, Schenley Distillers, Inc.
Source: One well.
Well 8510-3840-8. Depth, 105 ft; diameter, 6 in.; date drilled, 1945; water-bearing stratum, Quaternary alluvium; yield, 450 gpm.
Treatment: Commercial boiler-water treatment.
Storage: 11,000 gal in cistern.

Analysis, in parts per million, well 8510-3840-8

(Collected Sept. 5, 1951.)

Silica (SiO_2)	17	Fluoride (F)	0.0
Iron (Fe)	1.7	Nitrate (NO_3)	25
Manganese (Mn)	.37	Dissolved solids	542
Calcium (Ca)	112	Hardness as $CaCO_3$	
Magnesium (Mg)	42	Total	452
Sodium (Na)	18	Noncarbonate	103
Potassium (K)	1.6	Temperature (°F)	56
Bicarbonate (HCO_3)	426	pH	7.5
Sulfate (SO_4)	87	Specific conductance at 25°C (micromhos)	847
Chloride	26		

Carrollton, C and M Sand Co.

Ownership: C and M Sand Co.
Source: One well, 8 1/2 miles northwest of town on Kentucky Highway 36. Well 8515-3840-2. Depth, 104 ft; diameter, 8 in.; date drilled, June 1950; water-bearing stratum, Quaternary alluvium; static water level, 50 ft below land surface; yield, 500 gpm.
Treatment: None.
Storage: None.
Total distribution of water for average year: 34,650,000 gal.
Average daily pumpage: 95,000 gal.

Carrollton, Carrollton Gravel and Sand Co., Inc.

Ownership: Carrollton Gravel and Sand Co., Inc.
Source: One well, 8 miles northwest of town on Kentucky Highway 36. Well 8515-3840-1. Depth, 130 ft; diameter, 12 in.; date drilled, 1949; water-bearing stratum, Quaternary alluvium; static water level, 30 ft below land surface; yield, 1,000 gpm.
Treatment: None.
Storage: None.
Total distribution of water for average year: 20,385,000 gal.
Average daily pumpage: 56,000 gal.

Analysis, in parts per million, well 8515-3840-1

(Collected Sept. 5, 1951.)

Silica (SiO_2)	8.2	Fluoride (F)	0.0
Iron (Fe)	.22	Nitrate (NO_3)	3.5
Manganese (Mn)	.00	Dissolved solids	277
Calcium (Ca)	75	Hardness as $CaCO_3$	
Magnesium (Mg)	17	Total	256
Sodium (Na)	2.5	Noncarbonate	39
Potassium (K)	1.1	Temperature (°F)	52
Bicarbonate (HCO_3)	266	pH	7.7
Sulfate (SO_4)	31	Specific conductance at 25°C (micromhos)	467
Chloride (Cl)	2.2		

CLARK COUNTY

Winchester

Population served: 11,157.
Ownership: Municipal.
Source: Two impounding reservoirs on Lower Howards Creek, 4 1/2 miles southwest of town.
Treatment: Prechlorination, coagulation with alum and lime, activated carbon, rapid sand filtration, and postchlorination.
Capacity: 1,250,000 gpd.
Storage: 775,000 gal in two elevated tanks.
Total distribution of water for 1951: 308,365,000 gal.
Maximum monthly ..... July ..... 32,503,000 gal.
Minimum monthly ..... November ..... 22,555,000 gal.
Breakdown of annual distribution as to use, 1950:
Domestic ..... 179,440,694 gal.
Industrial ..... 52,640,758 gal.
Municipal ..... 37,923,750 gal.
Leakage and waste ..... 2,907,500 gal.
Unaccountable ..... 35,757,298 gal.
Average daily pumpage: 845,000 gal.

Regular determinations at treatment plant, 1950

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
pH	8.2	8.4	7.6	7.4	8.0	7.0

Average pumpage, in gallons per day, 1951

January	834,500	May	991,200	September	876,600
February	934,100	June	1,046,500	October	798,700
March	866,500	July	1,048,500	November	751,800
April	890,200	August	1,011,500	December	747,600

ESTILL COUNTY

Irvine

Population served: 3,259, Ravenna 979, total 4,238.
Ownership: Kentucky-Tennessee Electric and Water Co.
Source: Kentucky River at Madison Avenue.
Treatment: Coagulation with alum and lime, prechlorination, settlement, and postchlorination. Plant is located at source.
Capacity: 1,008,000 gpd.
Storage: 585,000 gal in settling basins and in two elevated tanks.
Total distribution of water for year, August 1950 to July 1951: 106,146,000 gal.
Maximum monthly ..... August ..... 9,800,000 gal.
Minimum monthly ..... April ..... 8,082,000 gal.
Average daily pumpage: 291,000 gal.

Regular determinations at treatment plant, January through July, 1951

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
pH	7.2	7.4	6.8	7.6	7.7	7.5
Hardness as $CaCO_3$ (ppm)	85.5	-	-	-	120	103
Turbidity	-	2,500	20	-	-	-

Ravenna, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: Kentucky River, 8355-3740-A.
Treatment: Alum and commercial boiler-water treatment.
Capacity: 500,000 gpd.
Storage: 250,000 gal in standpipes in yards.
Total distribution of water for 1951: 140,394,000 gal.
Average daily pumpage: 384,000 gal.

FAYETTE COUNTY

Lexington

Population served: 80,000.
Ownership: Lexington Water Co.
Source: Impounding reservoirs in East and West Hickman Creeks. Emergency supply from Kentucky River, 12 miles southeast of treatment plant.
Treatment: Coagulation with alum and lime, rapid sand filtration, chlorination, and ammoniation. Plant is located 3 miles southeast of town.
Capacity: 18,000,000 gpd.
Storage: 2,500,000 gal in surface and elevated storage tanks.
Total distribution of water for 1951: 3,113,500,000 gal.
Maximum monthly ..... July ..... 338,360,000 gal.
Minimum monthly ..... March ..... 216,170,000 gal.
Average daily pumpage: 8,530,000 gal.

Regular determinations at treatment plant, 1950

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	84	114	52	76	110	42
pH	7.5	8.4	7.2	7.4	8.0	7.2
Hardness as $CaCO_3$ (ppm)	80	101	64	84	108	63
Turbidity	49	240	10	.24	2.4	1
Temperature (°F)	-	78	36	-	-	-

Average pumpage, in gallons per day, 1951

January	8,900,000	May	9,421,600	September	9,313,700
February	8,924,300	June	9,917,700	October	9,129,400
March	6,973,200	July	10,914,800	November	7,973,000
April	8,441,300	August	10,728,700	December	8,130,600

FLEMING COUNTY

Flemingsburg

Population served: 1,400.
Ownership: Municipal.
Source: Impounding reservoir on southwest edge of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located at the reservoir.
Capacity: 100,000 gpd.
Storage: 100,000 gal in an elevated tank on west edge of town.
Total distribution of water for 1950-51: 30,000,000 gal.
Maximum monthly ..... June ..... 2,700,000 gal.
Minimum monthly ..... December ..... 2,500,000 gal.
Average daily pumpage: 82,000 gal.

FRANKLIN COUNTY

Frankfort

Population served: 15,449.
Ownership: Municipal.
Source: Kentucky River on south edge of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located at source.
Capacity: 7,500,000 gpd.
Storage: 6,800,000 gal in open surface reservoirs.
Total distribution of water for 1951: 840,623,700 gal.
Maximum monthly ..... August ..... 88,149,600 gal.
Minimum monthly ..... March ..... 64,275,550 gal.
Breakdown of annual distribution as to use, 1950:
Domestic ..... 157,971,600 gal.
Industrial and commercial ..... 457,944,000 gal.
Municipal ..... 36,000,000 gal.
Other ..... 202,116,225 gal.
Average daily pumpage: 2,577,000 gal.

Regular determinations at treatment plant, 1947

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	56	77	30	62	83	26
pH	7.3	7.4	6.8	7.5	7.7	7.0
Hardness as $CaCO_3$ (ppm)	120	142	89	130	155	95
Turbidity	25	3,000	20	-	-	-

Average pumpage, in gallons per day, 1951

January	2,216,000	May	2,334,800	September	2,682,800
February	2,604,800	June	2,620,600	October	2,433,800
March	2,073,400	July	2,417,600	November	2,390,300
April	2,348,700	August	2,843,500	December	2,310,500

Frankfort, The Benson Creek Distillery Co.

Ownership: The Benson Creek Distillery Co.
Source: One spring 8450-3810-1, and Benson Creek 8450-3810-B, 2 miles west of Frankfort on Benson Creek.
Treatment: Commercial boiler-water treatment.
Storage: 350,000 gal in covered surface tank.
Total distribution of water for average year: 52,500,000 gal.
Average daily pumpage: 144,000 gal.
Note: Spring will provide 350,000 gpd except during summer months.

Analysis, in parts per million, spring 8450-3810-1

(Collected June 4, 1952.)

Silica (SiO_2)	7.2	Fluoride (F)	0.1
Iron (Fe)	.39	Nitrate (NO_3)	22
Manganese (Mn)	.00	Dissolved solids	302
Calcium (Ca)	90	Hardness as $CaCO_3$	
Magnesium (Mg)	8.7	Total	262
Sodium (Na)	2.0	Noncarbonate	60
Potassium (K)	.5	Temperature (°F)	55
Bicarbonate (HCO_3)	245	pH	7.9
Sulfate (SO_4)	34	Specific conductance at 25°C (micromhos)	495
Chloride (Cl)	6.5		

Frankfort, Old Grand-Dad Distillery

Ownership: Old Grand-Dad Distillery, National Distillers Products Corp.
Source: Spring 8445-3810-1 and Elkhorn Creek, 8445-3810-A, 4 miles east of Frankfort at Forks of Elkhorn, on U. S. Highways 460 and 421.
Treatment: Chlorination.
Total distribution of water for average year: 518,400,000 gal.
From spring ..... 241,920,000 gal.
From Elkhorn Creek ..... 276,480,000 gal.
Average daily pumpage: 1,423,000 gal.
From spring ..... 663,000 gal.
From Elkhorn Creek ..... 757,000 gal.

Analysis, in parts per million, spring 8445-3810-1

(Collected June 3, 1952.)

Silica (SiO_2)	5.1	Fluoride (F)	0.2
Iron (Fe)	.14	Nitrate (NO_3)	4.7
Manganese (Mn)	.00	Dissolved solids	260
Calcium (Ca)	78	Hardness as $CaCO_3$	
Magnesium (Mg)	5.8	Total	218
Sodium (Na)	4.7	Noncarbonate	32
Potassium (K)	1.6	Temperature (°F)	-
Bicarbonate (HCO_3)	228	pH	7.2
Sulfate (SO_4)	24	Specific conductance at	
Chloride (Cl)	5.5	25°C (micromhos)	410

Frankfort, The Geo. T. Stagg Co.

Ownership: The Geo. T. Stagg Co., Schenley Distillers, Inc.
Source: Kentucky River, 8450-3810-A.
Treatment: Commercial boiler-water treatment.
Storage: 650,000 gal tanks and concrete reservoirs.

GALLATIN COUNTY

Warsaw

Population served: 900.
Ownership: Municipal.
Source: Two wells.
Well 8450-3845-1. Depth, 140 ft; diameter, 10 in.; date drilled, 1935; water-bearing stratum, Quaternary alluvium; static water level, 66 ft below land surface in 1935; yield, 250 gpm.
Well 8450-3845-2. Depth, 148 ft; diameter, 10 in.; date drilled, 1949; water-bearing stratum, Quaternary alluvium; static water level, 66 ft below land surface in 1949; yield, 250 gpm.
Treatment: Chlorine and Calgon for softening.
Storage: 50,000 gal in elevated tanks at wells in center of town.
Total distribution of water for average year: 14,600,000 gal.
Average daily pumpage: 40,000 gal.

Analysis, in parts per million, well 8450-3845-1

(Collected July 18, 1951.)

Silica (SiO_2)	14	Fluoride (F)	0.8
Iron (Fe)	.26	Nitrate (NO_3)	22
Manganese (Mn)	-	Dissolved solids	363
Calcium (Ca)	92	Hardness as $CaCO_3$	
Magnesium (Mn)	23	Total	324
Sodium (Na)	5.6	Noncarbonate	41
Potassium (K)	3.5	Temperature (°F)	56
Bicarbonate (HCO_3)	346	pH	7.4
Sulfate (SO_4)	31	Specific conductance at 25°C (micromhos)	616
Chloride (Cl)	5.2		

Warsaw, Gallatin Sand & Gravel Co.

Ownership: Ientha Smith, supplying Gallatin Sand & Gravel Co.
Source: One well, 1 mile east of town on U. S. Highway 42.
Well 8450-3845-9. Depth, 80 ft; diameter, 6 in.; date drilled, 1949; water-bearing stratum, Quaternary alluvium; static water level, 38 ft below land surface in June 1951; yield, 120+ gpm.
Total distribution of water for average year: 10,368,000 gal.
Average daily pumpage: 28,000 gal.

Analysis, in parts per million, well 8450-3845-9

(Collected Aug. 14, 1952.)

Silica (SiO_2)	12	Fluoride (F)	0.2
Iron (Fe)	.07	Nitrate (NO_3)	5.9
Manganese (Mn)	.00	Dissolved solids	297
Calcium (Ca)	70	Hardness as $CaCO_3$	
Magnesium (Mg)	23	Total	271
Sodium (Na)	3.5	Noncarbonate	37
Potassium (K)	1.7	Temperature (°F)	56
Bicarbonate (HCO_3)	283	pH	7.4
Sulfate (SO_4)	37	Specific conductance at 25°C (micromhos)	514
Chloride (Cl)	1.9		

Lancaster

Population served: 2,394.
Ownership: Municipal.
Source: One well and impounding reservoir, 1 1/2 miles west of town.
Well 8435-3735-1. Depth, 128 ft; diameter, 6 in.; date drilled, 1940; water-bearing stratum, Upper Ordovician rocks; static water level, 68 ft below land surface on October 3, 1951; yield, 21 gpm.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located at the reservoir.
Capacity: 250,000 gpd, to be increased to 750,000 gpd by 1952.
Storage: 220,000 gal in elevated tank in northwest corner of town.
Total distribution of water for average year: 27,355,000 gal.
Maximum monthly ..... July ..... 3,000,000 gal.
Minimum monthly ..... January ..... 2,000,000 gal.
Average daily pumpage: 75,000 gal.

Analysis, in parts per million, well 8435-3735-1

(Collected Oct. 3, 1951.)

Silica (SiO_2)	9.4	Fluoride (F)	0.2
Iron (Fe)	.16	Nitrate (NO_3)	2.7
Manganese (Mn)	.00	Dissolved solids	720
Calcium (Ca)	86	Hardness as $CaCO_3$	
Magnesium (Mg)	35	Total	360
Sodium (Na)	128	Noncarbonate	8
Potassium (K)	15	Temperature (°F)	57
Bicarbonate (HCO_3)	428	pH	7.2
Sulfate (SO_4)	98	Specific conductance at 25°C (micromhos)	1,180
Chloride (Cl)	142		

GRANT COUNTY

Williamstown

Population served: 1,463, Dry Ridge 400, total 1,863.
Ownership: Municipal.
Source: Impounding reservoir a quarter of a mile north of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located at the source.
Capacity: 300,000 gpd.
Storage: 75,000 gal in elevated tank in Williamstown and 50,000 gal in elevated tank in Dry Ridge.
Total distribution of water for 1950: 43,000,000 gal.
Maximum monthly ..... August ..... 3,900,000 gal.
Minimum monthly ..... February ..... 3,300,000 gal.
Average daily pumpage: 117,000 gal.

HARRISON COUNTY

Cynthiana

Population served: 4,832.
Ownership: Municipal.
Source: Licking River on the south edge of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located at the source.
Capacity: 1,500,000 gpd.
Storage: 310,000 gal in standpipe on southeast edge of town. An additional standpipe is planned which will increase storage to 610,000 gal.
Total distribution of water for 1950: 170,000,000 gal.
Maximum monthly ..... August ..... 15,757,000 gal.
Minimum monthly ..... February ..... 12,453,000 gal.
Average daily pumpage: 466,000 gal.

Lair, Carstairs Bros. Distilling Co., Inc.

Ownership: Carstairs Bros. Distilling Co., Inc., Joseph E. Seagram & Sons, Inc., Louisville, Kentucky
Source: One well and Licking River, 8415-3820-A.
Well 8415-3820-14. Depth, 127 ft; diameter, 12 in.; date drilled, April 1945; water-bearing stratum, Middle Ordovician rocks; yield, 100 gpm.
Treatment: Commercial boiler-water treatment
Storage: 20,000 gal.

Analysis, in parts per million, well 8415-3820-14

(Collected Jan. 2, 1952.)

Silica (SiO_2)	8.7	Fluoride (F)	0.2
Iron (Fe)	6.6	Nitrate (NO_3)	1.0
Manganese (Mn)	.21	Dissolved solids	345
Calcium (Ca)	62	Hardness as $CaCO_3$	
Magnesium (Mg)	31	Total	280
Sodium (Na)	19	Noncarbonate	23
Potassium (K)	4.2	Temperature (°F)	56
Bicarbonate (HCO_3)	316	pH	7.9
Sulfate (SO_4)	30	Specific conductance at 25°C (micromhos)	589
Chloride (Cl)	24		

HENRY COUNTY

Campbellsburg

Population served: 500.
Ownership: Municipal.
Source: Impounding reservoir half a mile north of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located at the source.
Capacity: 144,000 gpd.
Storage: 624,000 gal in elevated tank.

Eminence

Population served: 1,456, Newcastle 750, total 2,206.
Ownership: Municipal.
Source: Impounding reservoir, 1 mile north of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located at the source.
Capacity: 430,000 gpd.
Storage: 750,000 gal in elevated tanks in Eminence and Newcastle.
Total distribution of water for 1950: 37,878,000 gal.
Maximum monthly ..... September ..... 5,025,000 gal.
Minimum monthly ..... July ..... 2,323,000 gal.
Average daily pumpage: 104,000 gal.

JEFFERSON COUNTY

Louisville

Population served: 450,000.
Ownership: Municipal.
Source: Ohio River.
Treatment: Sedimentation, coagulation with aluminum sulfate, clarification, filtration, chlorination, control of pH with lime, activated carbon, chlorine dioxide, softening with lime and soda ash, and fluoridation.
Capacity: 80,000,000 gpd.
Storage: Raw water 131,000,000 gal; finished water 57,750,000 gal.
Total distribution of water for 1951: 23,215,079,000 gal.
Maximum monthly ..... August ..... 2,301,516,000 gal.
Minimum monthly ..... February ..... 1,720,040,000 gal.
Average daily pumpage, 1951: 63,603,000 gal.

Regular determinations at treatment plant, 1951

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	56	69	45	37	50	31
pH	7.2	-	-	8.8	-	-
Hardness as $CaCO_3$ (ppm)	134	197	92	99	125	86
Turbidity	117	299	6	0	1	0
Temperature (°F)	-	-	-	-	77	36

Ground-water pumpage in the Louisville area

The ground-water resources of the Louisville area have been studied in detail by M. I. Rorabaugh and others. (See list of references at the end of this report.)

Average daily pumpage for 1951, in gallons per day, is summarized as follows:

Rubber and chemical	11,737,000
Distilling	5,934,000
Brewing	3,492,000
Oil refining	3,139,000
Air conditioning	2,851,000
Metal working	1,168,000
Meat packing	951,000
Dairies and creameries	677,000
Tobacco	573,000
Miscellaneous	542,000
Ice manufacturing	431,000
Gas and electricity	200,000
Food manufacturing	129,000
Total	31,824,000

During 1951 a total of 1,624,000 gpd was returned to the ground as artificial recharge in the Louisville area. This is not included in the above tabulation.

Ground-water pumpage in southwest Jefferson County

Outside the Louisville area about 547,000 gpd is pumped from the ground in Jefferson County. This amount is used as follows:

Public supply (Louisville Extension Water District)	242,000
Irrigation	175,000
Distilling	100,000
Fisheries	20,000
Cement manufacturing	10,000
Total	547,000

Industrial surface-water pumpage in Louisville area

Southwest Jefferson County; E. I. DuPont DeNemours and Co., Inc.; Carbide and Carbon Chemicals Division, Union Carbide and Carbon Corporation; and Kosmos Portland Cement Co.

Total distribution of water for 1951: 15,019,750,000 gal.

Average daily pumpage: 41,150,000 gal.

JESSAMINE COUNTY

Camp Nelson, Kentucky River Distillery, Inc.

Ownership: Kentucky River Distillery, Inc.
Source: Two wells and Kentucky River, 8435-3745-A.
Well 8435-3745-16. Depth, 125 ft; diameter, 8 in.; date drilled, 1936; water-bearing strata, Lower Ordovician rocks; static water level, 60 ft below land surface; yield, 100 gpm.
Well 8435-3745-17. Depth, 200 ft; diameter, 10 in.; date drilled, 1940; water-bearing strata, Lower Ordovician rocks; static water level, 60 ft below land surface; yield, 225 gpm.
Treatment: Commercial boiler-water treatment.
Storage: 45,000 gal.
Total distribution of water for year 1950-51: 3,360,000 gal.
Average daily pumpage: 9,000 gal.

Analysis, in parts per million, well 8435-3745-16

(Collected Aug. 23, 1951.)

Silica (SiO_2)	11	Fluoride (F)	0.2
Iron (Fe)	11	Nitrate (NO_3)	5.0
Manganese (Mn)	.36	Dissolved solids	307
Calcium (Ca)	86	Hardness as $CaCO_3$	
Magnesium (Mg)	12	Total	264
Sodium (Na)	8.5	Noncarbonate	13
Potassium (K)	2.2	Temperature (°F)	58
Bicarbonate (HCO_3)	306	pH	7.4
Sulfate (SO_4)	26	Specific conductance at 25°C (micromhos)	526
Chloride (Cl)	9.0		

Nicholasville

Population served: 3,454.
Ownership: Municipal.
Source: Ten wells.

Well 8430-3750-16. Depth, 145 ft; diameter, 6 in.; water-bearing strata, Middle Ordovician rocks; static water level, 70 ft below land surface on September 19, 1951; yield, 60 gpm.

Well 8430-3750-17. Depth, 150 ft; diameter, 6 in.; date drilled, 1943; water-bearing strata, Middle Ordovician rocks.

Well 8430-3750-18. Depth 80 ft; diameter, 5 in.; water-bearing strata, Middle Ordovician rocks; yield, 60 gpm.

Well 8430-3750-19. Diameter, 6 in.; water-bearing strata, Middle Ordovician rocks; static water level, 70 ft below land surface; yield, 60 gpm.

Well 8435-3750-44. Depth, 175 ft; diameter, 6 in.; water-bearing strata, Middle Ordovician rocks.

Well 8435-3750-45. Depth, 150 ft; diameter 6 in.; water-bearing strata, Middle Ordovician rocks.

Well 8435-3750-46. Depth, 140 ft; diameter, 6 in.; water-bearing strata, Middle Ordovician rocks.

Well 8435-3750-47. Depth, 130 ft; diameter, 6 in.; water-bearing strata, Middle Ordovician rocks.

Well 8435-3750-48. Diameter, 6 in.; water-bearing strata, Middle Ordovician rocks.

Well 8435-3750-49. Diameter, 6 in.; water-bearing strata, Middle Ordovician rocks.

Treatment: Chlorination.
Storage: 800,000 gal in two elevated tanks and one surface storage tank.
Total distribution of water for 1950: 91,250,000 gal.
Average daily pumpage: 250,000 gal.
Note: Wells 8435-3750-44 through 49 are pumped by a single airlift system at the rate of 400 gpm.

Analysis, in parts per million, wells 8430-3750-18 and 19

(Collected Sept. 19, 1951.)

Silica (SiO_2)	4.9	Fluoride (F)	0.1
Iron (Fe)	.56	Nitrate (NO_3)	1.4
Manganese (Mn)	.28	Dissolved solids	183
Calcium (Ca)	50	Hardness as $CaCO_3$	
Magnesium (Mg)	7.3	Total	154
Sodium (Na)	3.5	Noncarbonate	29
Potassium (K)	.7	Temperature (°F)	65
Bicarbonate (HCO_3)	154	pH	7.7
Sulfate (SO_4)	26	Specific conductance at 25°C (micromhos)	307
Chloride (Cl)	6.5		

Analysis, in parts per million, well 8435-3750-44

(Collected Sept. 19, 1951.)

Silica (SiO_2)	6.4	Fluoride (F)	0.2
Iron (Fe)	.47	Nitrate (NO_3)	1.7
Manganese (Mn)	.00	Dissolved solids	310
Calcium (Ca)	82	Hardness as $CaCO_3$	
Magnesium (Mg)	14	Total	262
Sodium (Na)	5.3	Noncarbonate	49
Potassium (K)	2.1	Temperature (°F)	56
Bicarbonate (HCO_3)	260	pH	8.0
Sulfate (SO_4)	49	Specific conductance at 25°C (micromhos)	507
Chloride (Cl)	9.5		

Wilmore

Population served: 2,431.
Ownership: Asbury College.
Source: Four wells and Kentucky River.
Well 8435-3750-50. Depth, 300 ft; diameter, 8 in.; date drilled, 1946; water-bearing strata, Middle Ordovician rocks; static water level, 75 ft below land surface; yield, 60 gpm.
Well 8435-3750-51. Depth, 225 ft; diameter, 6 in.; date drilled, 1933; water-bearing strata, Middle Ordovician rocks; static water level, 45 ft below land surface; yield, 40 gpm.
Well 8435-3750-52. Depth, 200 ft; diameter, 8 in.; date drilled, 1934; water-bearing strata, Middle Ordovician rocks, static water level, 20 ft below land surface; yield, 50 gpm.
Well 8440-3750-13. Depth, 301 ft; diameter, 10 in.; date drilled, 1943; water-bearing strata, Middle Ordovician rocks; static water level, 25 ft below land surface; yield, 75 gpm.
Treatment: Coagulation with alum and lime, activated charcoal, rapid sand filtration, and chlorination. Plant is located 1 1/2 miles west of town.
Capacity: 432,000 gpd.
Storage: 110,000 gal in elevated tank and clear well.
Total distribution of water for 1950: 38,600,000 gal.
Maximum monthly ..... October ..... 4,500,000 gal.
Minimum monthly ..... August ..... 2,050,000 gal.
Average daily pumpage: 106,000 gal.
Note: Wells are used only occasionally.

Analysis, in parts per million, well 8435-3750-50

(Collected Sept. 19, 1951.)

Silica (SiO_2)	4.4	Fluoride (F)	0.2
Iron (Fe)	10	Nitrate (NO_3)	1.0
Manganese (Mn)	.00	Dissolved solids	347
Calcium (Ca)	82	Hardness as $CaCO_3$	
Magnesium (Mg)	14	Total	262
Sodium (Na)	15	Noncarbonate	80
Potassium (K)	2.2	Temperature (°F)	-
Bicarbonate (HCO_3)	222	pH	7.6
Sulfate (SO_4)	75	Specific conductance at 25°C (micromhos)	560
Chloride (Cl)	26		

KENTON COUNTY

Covington

Population served: 64,282, Fort Thomas 10,830, Ludlow 6,485, Erlanger 5,115, Elsmere 3,481, South Fort Mitchell 3,139, Park Hills 2,570, Bromley 2,181, Highland Heights 1,567, Cold Springs 1,564, Lakeside Park 1,350, Florence 1,315, Edgewood 1,000, Crescent Springs 700, Lookout Heights 700, Fort Wright 588, Winston Park 588, Forest Hills 500, Fort Mitchell 425, South Hills 411, Kenton Vale 163, Kenton Hills 100, total 109,054.
Ownership: Municipal.
Source: Ohio River, 4 miles east of town.
Treatment: Coagulation with alum and lime, prechlorination, ammoniation, rapid sand filtration, and postchlorination. Plant is located in Fort Thomas, Campbell County.
Capacity: 36,000,000 gpd.
Storage: 7,000,000 gal in elevated tanks.
Total distribution of water for 1951: 4,057,870,000 gal.
Maximum monthly ..... August ..... 421,080,000 gal.
Minimum monthly ..... February ..... 284,990,000 gal.
Average daily pumpage: 11,976,000 gal.

Regular determinations at treatment plant, 1950

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	29	39	14	39	49	27
pH	7.3	8.1	7.0	8.1	9.0	7.2
Hardness as $CaCO_3$ (ppm)	129	196	90	136	198	110
Turbidity	241	1,200	5	-	-	-

Ground-water pumpage in the Covington-Newport area

The ground-water resources of the Covington-Newport alluvial area have been studied by E. H. Walker. (See list of references at end of this report.)

Average daily pumpage for industrial purposes is 3,700,000 gal and is used as follows:

Brewing and distilling	2,738,000 gpd.
Air conditioning	518,000 gpd.
Food processing and ice manufacturing	296,000 gpd.
Miscellaneous	148,000 gpd.

LEWIS COUNTY

Vanceburg

Population served: 1,000.
Ownership: Municipal.
Source: Two wells.
Well 8315-3835-1. Depth, 76 ft; diameter, 10 in.; date drilled, 1929; water-bearing stratum, Quaternary alluvium; yield 75 gpm.
Well 8315-3835-2. Depth 76 ft; diameter, 10 in.; date drilled, 1929; water-bearing stratum, Quaternary alluvium; yield, 75 gpm.
Treatment: Aeration and chlorination.
Storage: 150,000 gal in surface tank.
Total distribution of water for average year: 13,500,000 gal.
Maximum monthly ..... August ..... 1,500,000 gal.
Minimum monthly ..... February ..... 1,000,000 gal.
Average daily pumpage: 37,000 gal.

Analysis, in parts per million, well 8315-3835-1

(Collected July 18, 1951.)

Silica (SiO_2)	15	Fluoride (F)	0.1
Iron (Fe)	7.6	Nitrate (NO_3)	6.0
Manganese (Mn)	-	Dissolved solids	1,740
Calcium (Ca)	246	Hardness as $CaCO_3$	
Magnesium (Mg)	57	Total	850
Sodium (Na)	236	Noncarbonate	581
Potassium (K)	21	Temperature (°F)	56
Bicarbonate (HCO_3)	326	pH	6.8
Sulfate (SO_4)	81	Specific conductance at 25°C (micromhos)	3,080
Chloride (Cl)	720		

LINCOLN COUNTY

Crab Orchard

Population served: 500.
Ownership: Municipal.
Source: One spring, 8430-3725-1, and impounding reservoir.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination.
Capacity: 432,000 gpd.
Storage: 75,000 gal in elevated tank on west edge of town.
Total distribution of water for average year: 6,100,000 gal.
Average daily pumpage: 14,000 gal.

Analysis, in parts per million, spring 8430-3725-1

(Collected Oct. 3, 1951.)

Silica (SiO_2)	11	Fluoride (F)	0.1
Iron (Fe)	.34	Nitrate (NO_3)	26
Manganese (Mn)	.00	Dissolved solids	356
Calcium (Ca)	66	Hardness as $CaCO_3$	
Magnesium (Mg)	31	Total	286
Sodium (Na)	19	Noncarbonate	59
Potassium (K)	3.8	Temperature (°F)	59
Bicarbonate (HCO_3)	284	pH	7.3
Sulfate (SO_4)	47	Specific conductance at 25°C (micromhos)	594
Chloride (Cl)	20		

Stanford

Population served: 1,885.
Ownership: Kentucky Water Service Co., Inc., Somerset, Kentucky.
Source: Impounding reservoir, partially spring fed, located on Water Works Road several blocks west of U. S. Highway 150.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located at the source.
Capacity: 200,000 gpd.
Storage: 250,000 gal in elevated tank at the treatment plant.
Total distribution of water for 1950: 51,135,800 gal.
Maximum monthly ..... July ..... 5,152,700 gal.
Minimum monthly ..... February ..... 3,603,100 gal.
Average daily pumpage: 140,000 gal.

Analysis, in parts per million, spring 8440-3730-1.

(Collected Oct. 3, 1951.)

Silica (SiO_2)	4.6	Fluoride (F)	0.1
Iron (Fe)	.88	Nitrate (NO_3)	1.6
Manganese (Mn)	.00	Dissolved solids	153
Calcium (Ca)	30	Hardness as $CaCO_3$	
Magnesium (Mg)	14	Total	134
Sodium (Na)	6.5	Noncarbonate	8
Potassium (K)	2.4	Temperature (°F)	64
Bicarbonate (HCO_3)	152	pH	7.6
Sulfate (SO_4)	1.7	Specific conductance at	
Chloride (Cl)	12	25°C (micromhos)	285

MADISON COUNTY

Berea

Population served: 3,800.
Ownership: Berea College.
Source: Spring 8410-3730-1 and impounding reservoir, 3 miles southeast of town.
Treatment: Chlorination and ammoniation. The treatment plant is located at the college in town.
Storage: 250,000 gal in elevated tank at treatment plant.
Total distribution of water for year 1950-51: 132,629,000 gal.
Maximum monthly ..... March ..... 12,692,000 gal.
Minimum monthly ..... August ..... 9,110,000 gal.
Average daily pumpage: 363,000 gal.

Analysis, in parts per million, spring 8410-3730-1

(Collected Aug. 22, 1951.)

Silica (SiO_2)	7.6	Fluoride (F)	0.0
Iron (Fe)	.16	Nitrate (NO_3)	1.0
Manganese (Mn)	.00	Dissolved solids	126
Calcium (Ca)	40	Hardness as $CaCO_3$	
Magnesium (Mg)	3.4	Total	114
Sodium (Na)	.5	Noncarbonate	1
Potassium (K)	.2	Temperature (°F)	-
Bicarbonate (HCO_3)	138	pH	7.3
Sulfate (SO_4)	2.0	Specific conductance at 25°C (micromhos)	226
Chloride (Cl)	1.0		

Richmond

Population served: 10,717.
Ownership: Municipal.
Source: Impounding reservoir, 2 miles east of town on Kentucky Highway 52. Has an 8-inch auxiliary supply line from Blue Grass Ordnance Depot.
Treatment: Prechlorination, coagulation with alum and lime, rapid sand filtration, ammoniation, and postchlorination. Plant is located at the reservoir.
Capacity: 1,500,000 gpd.
Storage: 1,300,000 gal in clear well at plant and elevated tank in town.
Total distribution of water for 1950: 328,359,000 gal.
Maximum monthly ..... December ..... 29,695,000 gal.
Minimum monthly ..... April ..... 25,596,000 gal.
Average daily pumpage: 899,000 gal.

Regular determinations at treatment plant, 1950

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	119	157	70	108	138	60
pH	8.1	8.4	7.5	7.5	8.1	7.5
Hardness as $CaCO_3$ (ppm)	77	92	62	80	94	68
Turbidity	21	165	10	-	-	-

Richmond, Blue Grass Ordnance Depot

Population served: 2,500.
Ownership: Blue Grass Ordnance Depot, United States Army.
Source: Impounding reservoir, 8410-3740-A.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination.
Capacity: 750,000 gpd.
Storage: 250,000 gal in elevated tank.
Total distribution of water for average year: 60,000,000 gal.
Average daily pumpage: 164,000 gal.

Regular determinations at treatment plant, 1951

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	103	125	85	89	122	83
pH	7.5	7.7	7.0	7.6	8.4	7.2
Hardness as $CaCO_3$ (ppm)	133	154	114	158	174	152
Turbidity	35	425	25	-	-	-

MARION COUNTY

Bradfordsville

Population served: 350.
Ownership: Municipal.
Source: One well.
Well 8510-3725-1. This well is a wooden box 6 ft square buried in gravel about 50 ft from the Rolling Fork River on the north edge of town.
Treatment: Chlorination.
Storage: 55,000 gal in surface tank.
Total distribution of water for 1950: 2,990,600 gal.
Maximum monthly ..... March ..... 336,800 gal.
Minimum monthly ..... August ..... 142,900 gal.
Average daily pumpage: 8,000 gal.

Dant, The Dant Distillery Co.

Ownership: The Dant Distillery Co.
Source: Impounding reservoir, 8525-3735-A.
Storage: 10,000 gal in elevated tank.
Average daily pumpage, when in operation: 50,000 gal.

Lebanon

Population served: 4,643.
Ownership: Municipal.
Source: Dam in Rolling Fork River, 6 miles south of town at Calvary.
Treatment: Coagulation with alum and lime, rapid sand filtration, ammoniation and chlorination. Plant is located at the source.
Capacity: 1,000,000 gpd.
Storage: 1,000,000 gal in standpipes, 4 1/2 miles south of town.
Total distribution of water for 1950: 187,050,000 gal.
Maximum monthly ..... August ..... 17,295,000 gal.
Minimum monthly ..... April ..... 13,425,000 gal.
Average daily pumpage: 513,000 gal.

MASON COUNTY

Maysville

Population served: 14,500.
Ownership: Maysville Water Co. (privately owned).
Source: Ohio River.
Treatment: Prechlorination, coagulation with alum and lime, rapid sand filtration, ammoniation, fluoridation, and postchlorination.
Capacity: 3,500,000 gpd.
Storage: 2,500,000 gal in surface reservoir on hill south of town.
Total distribution of water for 1951: 356,560,000 gal.
Maximum monthly ..... August ..... 34,590,000 gal.
Minimum monthly ..... April ..... 25,620,000 gal.
Breakdown of annual distribution as to use, 1950:
Domestic ..... 77,371,200 gal.
Industrial and commercial ..... 181,665,600 gal.
Municipal ..... 63,676,200 gal.
Average daily pumpage: 977,000 gal.

Regular determinations at treatment plant, 1950

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	48	61	31	54	69	40
pH	7.4	8.1	6.3	8.3	9.1	7.0
Hardness as $CaCO_3$ (ppm)	107	140	80	99	120	80
Turbidity	173	850	20	-	-	-

Average pumpage, in gallons per day, 1951

January	943,500	May	856,500	September	1,020,000
February	938,600	June	1,003,000	October	992,900
March	951,900	July	965,800	November	945,000
April	854,000	August	1,115,800	December	1,000,000

Burgin

Population served: 700.
Ownership: Municipal.
Source: One well.
Well 8445-3745-1. Depth, 20 ft; diameter, 11 by 15 ft; date dug, 1936; water-bearing stratum, Middle Ordovician rocks; static water level, 18.07 ft below land surface on October 4, 1951; yield, 175 gpm.
Treatment: Chlorination.
Storage: 90,000 gal in two concrete surface tanks.
Total distribution of water for average year: 18,959,600 gal.
Average daily pumpage: 52,000 gal.

Analysis, in parts per million, well 8445-3745-1

(Collected Oct. 4, 1951.)

Silica (SiO_2)	6.8	Fluoride (F)	0.1
Iron (Fe)	1.0	Nitrate (NO_3)	15
Manganese (Mn)	.00	Dissolved solids	310
Calcium (Ca)	94	Hardness as $CaCO_3$	
Magnesium (Mg)	7.8	Total	266
Sodium (Na)	5.0	Noncarbonate	50
Potassium (K)	3.1	Temperature (°F)	56
Bicarbonate (HCO_3)	264	pH	7.2
Sulfate (SO_4)	48	Specific conductance at 25°C (micromhos)	497
Chloride (Cl)	7.5		

Burgin, Blue Ribbon Distillery

Ownership: Blue Ribbon Distillery, Schenley Distillers, Inc.
Source: Impounding reservoir, 8445-3745-A.
Treatment: Commercial boiler-water treatment.
Average daily pumpage, when in operation: 250,000 gal.

Harrodsburg

Population served: 5,239.
Ownership: Municipal.
Source: Dam on Salt River, 1 1/2 miles west of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, activated carbon, ammoniation, and chlorination. Plant is located at the source.
Capacity: 600,000 gpd.
Storage: 250,000 gal in elevated tank on Linden Avenue in the southwest corner of town.
Total distribution of water for 1950: 99,000,000 gal.
Maximum monthly ..... August ..... 10,500,000 gal.
Minimum monthly ..... February ..... 7,000,000 gal.
Average daily pumpage: 273,000 gal.

Regular determinations at treatment plant, 1950

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	90	118	80	-	-	-
pH	-	8.0	6.8	7.6	7.8	7.0
Hardness as $CaCO_3$ (ppm)	110	140	80	120	150	90
Turbidity	-	5,000	25	-	-	-
Temperature (°F)	-	82	40	-	-	-

MONTGOMERY COUNTY

Mount Sterling

Population served: 5,800.
Ownership: Kentucky Water Service Co., Inc., Somerset, Kentucky.
Source: Dam and reservoir on Slate Creek, 7 miles east of town at Howard Mills. Reservoir holds 88,178,000 gal.
Treatment: Coagulation, rapid sand filtration, and chlorination.
Capacity: 1,440,000 gpd.
Storage: 225,000 gal in standpipe, three-quarters of a mile northeast of town.
Total distribution of water for year, September 1950 to August 1951: 150,071,000 gal.
Maximum monthly .....August ..... 15,717,000 gal.
Minimum monthly .....April ..... 10,858,000 gal.
Breakdown of annual distribution as to use:
Domestic ..... 53,930,000 gal.
Industrial and commercial ..... 45,531,000 gal.
Municipal ..... 19,200,000 gal.
Leakage and waste ..... 31,410,000 gal.
Average daily pumpage: 411,000 gal.

Regular determinations at treatment plant, 1950-51

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
pH	7.8	8.4	7.3	7.2	-	7.0

NELSON COUNTY

Bardstown

Population served: 4,185.
Ownership: Municipal.
Source: Impounding reservoir on Town Fork Creek on northeast edge of town.
Treatment: Coagulation with alum and lime, activated charcoal, and chlorination. Plant is located at source.
Capacity: 350,000 gpd.
Storage: 153,000 gal in elevated tank on east edge of town.
Total distribution of water for 1950: 127,687,800 gal.
Average daily pumpage: 350,000 gal.

Bardstown, Barton Distilling Co.

Ownership: Springs, Barton Distilling Co.; Tuers Lake, Mr. Kendall.
Source: Three springs, 8525-3745-1, 8525-3745-2, and 8525-3745-3; and Tuers Lake (impounding reservoir) 8525-3745-A.
Treatment: Commercial boiler-water treatment.
Storage: 200,000 gal in concrete surface reservoir and 39,000 gal in tanks. Total 239,000 gal.
Average daily pumpage, when in operation: 1,200,000 gal.
From springs ..... 10,000 gal.
From surface ..... 1,190,000 gal.

Analysis, in parts per million, spring 8525-3745-1

(Collected Feb. 14, 1952.)

Silica (SiO_2)	11	Fluoride (F)	0.1
Iron (Fe)	.17	Nitrate (NO_3)	37
Manganese (Mn)	.00	Dissolved solids	312
Calcium (Ca)	61	Hardness as $CaCO_3$	
Magnesium (Mg)	34	Total	290
Sodium (Na)	5.2	Noncarbonate	52
Potassium (K)	1.2	Temperature (°F)	56
Bicarbonate (HCO_3)	293	pH	7.7
Sulfate (SO_4)	19	Specific conductance at	
Chloride (Cl)	7.2	25°C (micromhos)	544

Bardstown, Glencoe Distilling Co.

Ownership: Glencoe Distilling Co.
Source: Three impounding reservoirs, 8525-3750-A, 3 miles north of town on Kentucky Highway 332.
Treatment: Commercial boiler-water treatment.
Storage: 19,000 gal in tank.
Average daily pumpage, when in operation: 100,000 gal.

Bardstown, Heaven Hill Distilleries, Inc.

Ownership: Heaven Hill Distilleries, Inc.
Source: Beech Fork and impounding reservoir, 8525-3745-C, 1 1/2 miles south of town on Kentucky Highway 49.
Treatment: Commercial boiler-water treatment.
Average daily pumpage, when in operation: 120,000 gal (60,000 gal are returned to the reservoir).

Bardstown, Nazareth College and Academy

Population served: 450.
Ownership: Nazareth College and Academy.
Source: Two impounding reservoirs, 1 1/2 miles north of town on U. S. Highways 31E and 150.
Treatment: Coagulation, rapid sand filtration, and chlorination.
Storage: 50,000 gal in elevated tank.

Bardstown, The Geo. T. Stagg Co.

Ownership: The Geo. T. Stagg Co., Schenley Distillers, Inc.
Source: Impounding reservoir, 8525-3745-B, 1 mile northeast of town on U. S. Highway 62.
Treatment: Commercial boiler-water treatment.
Storage: 5,000 gal in storage tank.

Bardstown, Waterfill & Frazier Distilling Co.

Ownership: Waterfill & Frazier Distilling Co.
Source: One spring, 8525-3745-4, and three impounding reservoirs, 8525-3750-B, 1 mile north of town, half a mile west of U. S. Highways 31E and 150.
Treatment: Commercial boiler-water treatment.
Storage: 20,000 gal.

Analysis, in parts per million, spring 8525-3745-4

(Collected Feb. 20, 1952.)

Silica (SiO_2)	9.2	Fluoride (F)	0.1
Iron (Fe)	.52	Nitrate (NO_3)	14
Manganese (Mn)	.00	Dissolved solids	185
Calcium (Ca)	35	Hardness as $CaCO_3$	
Magnesium (Mg)	22	Total	177
Sodium (Na)	1.6	Noncarbonate	16
Potassium (K)	.6	Temperature (°F)	55
Bicarbonate (HCO_3)	198	pH	7.9
Sulfate (SO_4)	8.6	Specific conductance at 25°C (micromhos)	335
Chloride (Cl)	1.9		

Bardstown, The Willett Distilling Co.

Ownership: The Willett Distilling Co.
Source: One well; one spring, 8525-3745-6; and five impounding reservoirs, 8525-3745-D, 2 miles south of town on Kentucky Highway 49.
Well 8525-3745-5. Depth, 125 ft; diameter, 6 in.; date drilled, 1945; water-bearing stratum, Silurian rocks; static water level, 100 ft below surface; yield, 5-10 gpm.
Treatment: Commercial boiler-water treatment.
Storage: 40,000 gal in tanks.
Average daily pumpage, when in operation: 165,000 gal.

Analysis, in parts per million, well 8525-3745-5

(Collected Feb. 21, 1952.)

Silica (SiO_2)	8.7	Fluoride (F)	0.1
Iron (Fe)	.52	Nitrate (NO_3)	27
Manganese (Mn)	.00	Dissolved solids	290
Calcium (Ca)	61	Hardness as $CaCO_3$	
Magnesium (Mg)	31	Total	280
Sodium (Na)	3.6	Noncarbonate	43
Potassium (K)	.9	Temperature (°F)	56
Bicarbonate (HCO_3)	289	pH	7.9
Sulfate (SO_4)	15	Specific conductance at 25°C (micromhos)	521
Chloride (Cl)	8.0		

Bloomfield

Population served: 825.
Ownership: Municipal.
Source: Four wells and impounding reservoir.
Well 8515-3750-1. Depth, 70 ft; diameter, 6 in.; date drilled, 1948; water-bearing stratum, Upper Ordovician rocks; yield, 35 gpm.
Well 8515-3750-2. Depth, 70 ft; diameter, 6 in.; date drilled, 1948; water-bearing stratum, Upper Ordovician rocks; yield, 35 gpm.
Well 8515-3750-3. Depth, 70 ft; diameter, 6 in.; date drilled, 1948; water-bearing stratum, Upper Ordovician rocks; yield, 35 gpm.
Well 8515-3750-4. Depth, 70 ft; diameter, 6 in.; date drilled, 1948; water-bearing stratum, Upper Ordovician rocks; yield, 35 gpm.
Treatment: Coagulation with alum and lime, and chlorination.
Capacity: 50,000 gpd.
Storage: Two surface tanks.
Total distribution of water for average year: 14,600,000 gal.
Average daily pumpage: 40,000 gal.

Analysis, in parts per million, well 8515-3750-1

(Collected Feb. 13, 1952.)

Silica (SiO_2)	6.2	Fluoride (F)	0.2
Iron (Fe)	.50	Nitrate (NO_3)	9.4
Manganese (Mn)	.09	Dissolved solids	364
Calcium (Ca)	93	Hardness as $CaCO_3$	
Magnesium (Mg)	12	Total	282
Sodium (Na)	16	Noncarbonate	54
Potassium (K)	7.4	Temperature (°F)	53
Bicarbonate (HCO_3)	278	pH	7.6
Sulfate (SO_4)	65	Specific conductance at 25°C (micromhos)	592
Chloride (Cl)	15		

Boston, Barton Warehouse & Distillery Corp.

Ownership: Barton Warehouse & Distillery Corp.
Source: Wilson Creek, 8540-3745-A.
Treatment: Commercial boiler-water treatment.
Storage: 60,000 gal.
Average daily pumpage, when in operation: 250,000 gal.

Deatsville, T. W. Samuels Distillery

Ownership: T. W. Samuels Distillery.
Source: Two wells; spring, 8530-3750-3; and three impounding reservoirs, 8530-3750-A.
Well 8530-3750-1. Depth, 85 ft; diameter, 8 in.; date drilled, 1943; water-bearing stratum, Silurian rocks.
Well 8530-3750-2. Depth, 100 ft; diameter, 6 in.; date drilled, 1935; water-bearing stratum, Silurian rocks.
Treatment: Commercial boiler-water treatment.
Storage: 47,000 gal in tanks.
Average daily pumpage, when in operation: 179,000 gal.

Analysis, in parts per million, well 8530-3750-1

(Collected Feb. 20, 1952.)

Silica (SiO_2)	7.5	Fluoride (F)	0.0
Iron (Fe)	3.3	Nitrate (NO_3)	6.0
Manganese (Mn)	.00	Dissolved solids	216
Calcium (Ca)	37	Hardness as $CaCO_3$	
Magnesium (Mg)	30	Total	215
Sodium (Na)	1.2	Noncarbonate	32
Potassium (K)	.6	Temperature (°F)	55
Bicarbonate (HCO_3)	224	pH	7.9
Sulfate (SO_4)	29	Specific conductance at	
Chloride (Cl)	2.0	25°C (micromhos)	393

Analysis, in parts per million, spring 8530-3750-3

(Collected Feb. 20, 1952.)

Silica (SiO_2)	9.5	Fluoride (F)	0.1
Iron (Fe)	.80	Nitrate (NO_3)	4.8
Manganese (Mn)	.24	Dissolved solids	140
Calcium (Ca)	29	Hardness as $CaCO_3$	
Magnesium (Mg)	16	Total	138
Sodium (Na)	1.4	Noncarbonate	3
Potassium (K)	.3	Temperature (°F)	56
Bicarbonate (HCO_3)	165	pH	7.3
Sulfate (SO_4)	1.5	Specific conductance at	
Chloride (Cl)	1.2	25°C (micromhos)	266

Fairfield, Julius Kessler Distilling Co.

Ownership: Julius Kessler Distilling Co., Joseph E. Seagram & Sons, Inc.
Source: One well and impounding reservoirs, 8520-3755-A.
Well 8520-3755-1. Depth, 200 ft; diameter, 6 in.; date drilled, 1944; water-bearing stratum, Upper Ordovician rocks; static water level, 100 ft below land surface; yield, 3-4 gpm.
Treatment: Commercial boiler-water treatment.
Storage: 21,000 gal in elevated tank.
Average daily pumpage, when in operation: 144,000 gal.

Analysis, in parts per million, well 8520-3755-1

(Collected Feb. 21, 1952.)

Silica (SiO_2)	2.4	Fluoride (F)	1.8
Iron (Fe)	.52	Nitrate (NO_3)	2.7
Manganese (Mn)	.26	Dissolved solids	761
Calcium (Ca)	31	Hardness as $CaCO_3$	
Magnesium (Mg)	21	Total	164
Sodium (Na)	230	Noncarbonate	0
Potassium (K)	8.3	Temperature (°F)	55
Bicarbonate (HCO_3)	299	pH	7.7
Sulfate (SO_4)	3.3	Specific conductance at 25°C (micromhos)	1,410
Chloride (Cl)	308		

Gethsemane, The Dant Distillery Co.

Ownership: The Dant Distillery Co., United Distillers of America, Inc.
Source: Pottenger Creek and impounding reservoir, 8530-3735-A.
Treatment: Commercial boiler-water treatment.
Storage: 75,000 gal in elevated tank and two cisterns.
Average daily pumpage, when in operation: 200,000 gal.

Greenbrier, Double Springs Distillers, Inc.

Ownership: Double Springs Distillers, Inc.
Source: Two springs, 8520-3745-1 and 8520-3745-2; and Mill Creek, 8520-3745-A.
Treatment: Commercial boiler-water treatment.
Storage: 322,000 gal in elevated tanks and concrete surface reservoir.
Average daily pumpage, when in operation: 1,000,000 gal.
From springs ..... 50,000 gal.
From surface ..... 950,000 gal.

Analysis, in parts per million, spring 8520-3745-1

(Collected Feb. 19, 1952.)

Silica (SiO_2)	11	Fluoride (F)	0.2
Iron (Fe)	.14	Nitrate (NO_3)	18
Manganese (Mn)	.00	Dissolved solids	205
Calcium (Ca)	41	Hardness as $CaCO_3$	
Magnesium (Mg)	22	Total	194
Sodium (Na)	1.9	Noncarbonate	27
Potassium (K)	.5	Temperature (°F)	56
Bicarbonate (HCO_3)	202	pH	7.8
Sulfate (SO_4)	16	Specific conductance at	
Chloride (Cl)	2.5	25°C (micromhos)	369

New Haven

Population served: 950.
Ownership: Municipal.
Source: Rolling Fork River.
Treatment: Coagulation with alum and lime, rapid sand filtration, activated carbon, and chlorination.
Capacity: 300,000 gpd.
Storage: 10,000 gal in elevated tank.
Total distribution of water for average year: 3,500,000 gal.
Maximum monthly ..... June ..... 500,000 gal.
Minimum monthly ..... December ..... 150,000 gal.
Average daily pumpage: 9,000 gal.

Trappist, Abbey of Gethsemane

Population served: 300.
Ownership: Abbey of Gethsemane.
Source: Impounding reservoir.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination.
Storage: 50,000 gal in elevated tank.
Total distribution of water for average year: 18,250,000 gal.
Average daily pumpage: 50,000 gal.

NICHOLAS COUNTY

Carlisle

Population served: 1,750.
Ownership: Municipal.
Source: Two impounding reservoirs on west edge of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located at the source.
Capacity: 550,000 gpd.
Storage: 140,000 gal in elevated tank at plant and 50,000 gal in clear well at plant.
Total distribution of water for average year: 29,000,000 gal.
Maximum monthly ..... June ..... 2,500,000 gal.
Minimum monthly ..... February ..... 2,000,000 gal.
Average daily pumpage: 79,000 gal.

OLDHAM COUNTY

La Grange

Population served: 2,000.
Ownership: Municipal.
Source: Impounding reservoir, 1 mile north of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, activated charcoal, and chlorination.
Capacity: 720,000 gpd.
Storage: 100,000 gal in elevated tank at First and Main Streets.
Total distribution of water for 1951: 21,900,000 gal.
Average daily pumpage: 60,000 gal.

La Grange, Kentucky State Reformatory

Population served: 2,200.
Ownership: Kentucky State Reformatory, Commonwealth of Kentucky.
Source: Impounding reservoir.
Treatment: Coagulation with alum and lime, and rapid sand filtration.
Capacity: 900,000 gpd.
Storage: 250,000 gal in elevated tank.
Total distribution of water for year, July 1950 to July 1951: 212,712,400 gal.
Maximum monthly ..... April ..... 22,025,400 gal.
Minimum monthly ..... October ..... 14,789,000 gal.
Average daily pumpage: 583,000 gal.

OWEN COUNTY

Owenton

Population served: 1,298.
Ownership: Municipal.
Source: Two impounding reservoirs, 2 miles southwest of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, activated carbon, and chlorination. Plant is located at the source.
Capacity: 300,000 gpd.
Storage: 75,000 gal in elevated tank in center of town.
Total distribution of water for average year: 30,000,000 gal.
Maximum monthly ..... August ..... 4,000,000 gal.
Minimum monthly ..... February ..... 2,000,000 gal.
Average daily pumpage: 82,000 gal.

Regular determinations at treatment plant, 1951

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
pH	8.3	8.6	8.0	7.6	8.0	7.4

PENDLETON COUNTY

Butler

Population served: 350.
Ownership: Municipal.
Source: Two wells in center of town.
Well 8420-3845-1. Depth, 125-150 ft; diameter, 6 in.; date drilled, 1910; water-bearing stratum, Quaternary alluvium or Middle Ordovician rocks or both; static water level, 90 ft below land surface; yield, 40 gpm.
Well 8420-3845-2. Depth, 200 ft; diameter, 6 in.; date drilled, 1945; water-bearing stratum, Quaternary alluvium or Middle Ordovician rocks or both; static water level, 60 ft below land surface; yield, 30 gpm.
Treatment: Chlorination.
Storage: 50,000 gal in elevated tank at well 8420-3845-2.
Total distribution of water for average year: 3,600,000 gal.
Average daily pumpage: 10,000 gal.

Analysis, in parts per million, well 8420-3845-2

(Collected Sept. 26, 1951.)

Silica (SiO_2)	13	Fluoride (F)	1.0
Iron (Fe)	2.2	Nitrate (NO_3)	2.4
Manganese (Mn)	.98	Dissolved solids	409
Calcium (Ca)	74	Hardness as $CaCO_3$	
Magnesium (Mg)	24	Total	286
Sodium (Na)	47	Noncarbonate	0
Potassium (K)	2.8	Temperature (°F)	58
Bicarbonate (HCO_3)	364	pH	7.0
Sulfate (SO_4)	7.2	Specific conductance at 25°C (micromhos)	725
Chloride (Cl)	50		

Falmouth

Population served: 2,907.
Ownership: Municipal.
Source: Licking River at east edge of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located at the source.
Capacity: 1,000,000 gpd.
Storage: 1,000,000 gal in surface reservoir on south edge of town.
Total distribution of water for average year: 146,000,000 gal.
Average daily pumpage: 400,000 gal.

POWELL COUNTY

Natural Bridge State Park

Population served: 200 May to October, 2 November to April.
Ownership: Natural Bridge State Park, Commonwealth of Kentucky.
Source: One spring.
Spring 8340-3745-1. Water-bearing stratum, Mississippian rocks.
Treatment: Rapid sand filtration and chlorination.
Storage: 6,000 gal in surface reservoir.
Total distribution of water for average year: 1,200,000 gal.
Monthly maximum ..... July ..... 320,000 gal.
Monthly minimum ..... December ..... very small.
Average daily pumpage: 3,500 gal.

Analysis, in parts per million, spring 8340-3745-1

(Collected July 25, 1951.)

Silica (SiO_2)	6.5	Fluoride (F)	0.0
Iron (Fe)	.20	Nitrate (NO_3)	.8
Manganese (Mn)	-	Dissolved solids	52
Calcium (Ca)	14	Hardness as $CaCO_3$	
Magnesium (Mg)	1.0	Total	38
Sodium (Na)	1.0	Noncarbonate	0
Potassium (K)	1.2	Temperature (°F)	57
Bicarbonate (HCO_3)	49	pH	6.5
Sulfate (SO_4)	2.2	Specific conductance at	
Chloride (Cl)	1.4	25°C (micromhos)	83.3

Stanton

Population served: 412.
Ownership: Municipal.
Source: One well.
Well 8350-3750-1. Depth, 150 ft; diameter, 6 in.; date drilled, 1934; water-bearing stratum, Quaternary alluvium; static water level, 17 ft below land surface; yield, 50 gpm; specific capacity, 1.67 gpm after 14 hr pumping.
Treatment: Chlorination. Plant is located at the source.
Storage: 50,000 gal in elevated tank at the source.
Total distribution of water for average year: 2,500,000 gal.
Maximum monthly ..... July ..... 250,000 gal.
Minimum monthly ..... December ..... 170,000 gal.
Average daily pumpage: 7,000 gal.

Analysis, in parts per million, well 8350-3750-1

(Collected July 25, 1951.)

Silica (SiO_2)	19	Fluoride (F)	0.2
Iron (Fe)	2.6	Nitrate (NO_3)	1.0
Manganese (Mn)	.07	Dissolved solids	246
Calcium (Ca)	19	Hardness as $CaCO_3$	
Magnesium (Mg)	2.9	Total	60
Sodium (Na)	64	Noncarbonate	0
Potassium (K)	1.8	Temperature (°F)	58
Bicarbonate (HCO_3)	164	pH	7.6
Sulfate (SO_4)	4.0	Specific conductance at 25°C (micromhos)	422
Chloride (Cl)	48		

ROWAN COUNTY

Morehead

Population served: 2,850.
Ownership: Morehead State College.
Source: Dam on Triplett Creek on southeast edge of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located at the source.
Capacity: 360,000 gpd. To be increased to 860,000 gpd.
Storage: 300,000 gal in surface reservoir. To be increased to 500,000 gal.
Total distribution of water for 1950: 98,000,000 gal.
Maximum monthly ..... April ..... 9,130,000 gal.
Minimum monthly ..... September ..... 7,260,000 gal.
Breakdown of annual distribution as to use:
Domestic ..... 55,000,000 gal.
Industrial and commercial ..... 10,000,000 gal.
College ..... 33,000,000 gal.
Average daily pumpage: 241,000 gal.

Georgetown

Population served: 5,465.
Ownership: Municipal.
Source: Royal Spring on Water Street, 1 block south of Main Street. Spring 8430-3810-54.
Treatment: Coagulation with alum and lime, and chlorination. Plant is located at the source.
Capacity: 1,200,000 gpd.
Storage: 600,000 gal in elevated tank on Mulberry Street, 1 block north of Main Street.
Total distribution of water for 1950: 150,151,500 gal.
Maximum monthly ..... October ..... 14,204,000 gal.
Minimum monthly ..... June ..... 10,990,000 gal.
Average daily pumpage: 411,000 gal.

Analysis, in parts per million, spring 8430-3810-54

(Collected Dec. 27, 1951.)

Silica (SiO_2)	8.3	Fluoride (F)	1.6
Iron (Fe)	.16	Nitrate (NO_3)	23
Manganese (Mn)	.04	Dissolved solids	201
Calcium (Ca)	58	Hardness as $CaCO_3$	
Magnesium (Mg)	3.9	Total	162
Sodium (Na)	2.0	Noncarbonate	44
Potassium (K)	1.0	Temperature (°F)	49
Bicarbonate (HCO_3)	143	pH	8.0
Sulfate (SO_4)	25	Specific conductance at	
Chloride (Cl)	3.5	25°C (micromhos)	329

Georgetown, Cardome School

Population served: 150.
Ownership: Cardome School.
Source: Three wells.
Well 8430-3810-29. Depth, 120 ft; water-bearing stratum, Middle Ordovician rocks.
Well 8430-3810-31. Depth, 135 ft; water-bearing stratum, Middle Ordovician rocks.
Well 8430-3810-32. Depth, 130 ft; water-bearing stratum, Middle Ordovician rocks.

Analysis, in parts per million, well 8430-3810-29

(Collected Feb. 21, 1952.)

Silica (SiO_2)	7.8	Fluoride (F)	0.9
Iron (Fe)	.37	Nitrate (NO_3)	.9
Manganese (Mn)	.00	Dissolved solids	325
Calcium (Ca)	59	Hardness as $CaCO_3$	
Magnesium (Mg)	29	Total	266
Sodium (Na)	21	Noncarbonate	19
Potassium (K)	3.3	Temperature (°F)	60
Bicarbonate (HCO_3)	302	pH	7.7
Sulfate (SO_4)	45	Specific conductance at 25°C (micromhos)	573
Chloride (Cl)	18		

Sadieville

Population served: 650.
Ownership: Municipal.
Source: Eagle Creek on west edge of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located at the source.
Capacity: 300,000 gpd.
Storage: 45,000 gal in elevated tank on south edge of town.

Regular determinations at treatment plant

Determination	Finished water		
	Avg	Max	Min
pH	6.7	6.8	6.5

Stamping Ground

Population served: 400.
Ownership: The Geo. T. Stagg Distillers, Inc., Schenley Distillers, Inc.; and municipal.
Source: Buffalo spring, 8440-3815-38 and Elkhorn Creek, 1 1/2 miles west of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located in the center of town.
Capacity: 200,000 gpd.
Storage: 50,000 gal in elevated tank on southwest edge of town.
Note: The spring is owned by The Geo. T. Stagg Distillers, Inc., Schenley Distillers, Inc. and the plant is owned by the municipality.

Analysis, in parts per million, spring 8440-3815-38

(Collected June 3, 1952.)

Silica (SiO_2)	9.1	Fluoride (F)	0.1
Iron (Fe)	.30	Nitrate (NO_3)	28
Manganese (Mn)	.00	Dissolved solids	264
Calcium (Ca)	76	Hardness as $CaCO_3$	
Magnesium (Mg)	6.3	Total	216
Sodium (Na)	3.4	Noncarbonate	43
Potassium (K)	.5	Temperature (°F)	-
Bicarbonate (HCO_3)	211	pH	7.7
Sulfate (SO_4)	19	Specific conductance at 25°C (micromhos)	430
Chloride (Cl)	6.4		

Stamping Ground, The Geo. T. Stagg Distillers, Inc.

Ownership: The Geo. T. Stagg Distillers, Inc., Schenley Distillers, Inc.
Source: Buffalo Spring, 8440-3815-38, and Stamping Ground
Note: For analysis of spring see Stamping Ground.

White Sulphur, Julius Kessler Distilling Co.

Ownership: Julius Kessler Distilling Co., Joseph E. Seagram & Sons, Inc. Midway, Kentucky.
Source: One well and South Elkhorn Creek, 8440-3810-A, 4 miles northwest of Midway, Woodford County.
Well 8440-3810-16. Depth, 115 ft; diameter, 6 in.; date drilled, 1936; water-bearing stratum, Middle Ordovician rocks; yield, 130 gpm.
Treatment: Commercial boiler-water treatment.

Analysis, in parts per million, well 8440-3810-16

(Collected Jan. 3, 1952.)

Silica (SiO_2)	10	Fluoride (F)	1.0
Iron (Fe)	.13	Nitrate (NO_3)	.7
Manganese (Mn)	.00	Dissolved solids	275
Calcium (Ca)	46	Hardness as $CaCO_3$	
Magnesium (Mg)	21	Total	200
Sodium (Na)	24	Noncarbonate	0
Potassium (K)	4.4	Temperature (°F)	56
Bicarbonate (HCO_3)	246	pH	7.5
Sulfate (SO_4)	32	Specific conductance at 25°C (micromhos)	482
Chloride (Cl)	15		

SHELBY COUNTY

Shelbyville

Population served: 4,395.
Ownership: Kentucky Water Service Co., Inc., Somerset, Kentucky.
Source: Impounding reservoirs on Clear Creek and tributaries, 1 1/2 miles northwest of town.
Treatment: Prechlorination, coagulation with alum and lime, rapid sand filtration, and postchlorination. Plant is located 1 1/2 miles northwest of courthouse in town.
Capacity: 750,000 gpd.
Storage: 194,000 gal in elevated tank on Clay Street, 1 block south of Main Street.
Total distribution of water for year, September 1950 through August 1951: 144,457,000 gal.
Maximum monthly ..... August ..... 15,739,000 gal.
Minimum monthly ..... November ..... 9,873,000 gal.
Average daily pumpage: 396,000 gal.

Regular determinations at treatment plant, 1951

Determination	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
pH	8.0	8.4	7.2	7.6	7.8	7.2

Shelbyville, Kentucky State Woman's Prison

Population served: 75.
Ownership: Kentucky State Woman's Prison, Commonwealth of Kentucky.
Source: Floyds Fork.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination.
Capacity: 200,000 gpd.
Storage: 50,000 gal in elevated tank.
Total distribution of water for 1951: 6,441,000 gal.
Maximum monthly ..... October ..... 648,000 gal.
Minimum monthly ..... February ..... 456,000 gal.
Average daily pumpage: 18,000 gal.

SPENCER COUNTY

Taylorsville

Population served: 950.
Ownership: Municipal.
Source: Salt River on south edge of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, activated carbon, and chlorination. Copper sulfate is used for algae control in summer. Plant is located at the source.
Capacity: 288,000 gpd.
Storage: 133,000 gal in elevated tank on northeast edge of town.
Total distribution of water for average year: 21,900,000 gal.
Maximum monthly ..... July ..... 2,100,000 gal.
Minimum monthly ..... December ..... 900,000 gal.
Average daily pumpage: 60,000 gal.

WASHINGTON COUNTY

Springfield

Population served: 2,822.
Ownership: Municipal.
Source: Impounding reservoir on Allens Run Creek at west edge of town.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Copper sulfate used in summer to control algae. Plant is located at the source.
Capacity: 500,000 gpd.
Storage: 225,000 gal in elevated tank.
Total distribution of water for 1950: 57,722,000 gal.
Maximum monthly ..... December ..... 5,468,000 gal.
Minimum monthly ..... April ..... 4,299,000 gal.
Average daily pumpage: 158,000 gal.

WOODFORD COUNTY

Glenns Creek Station, Old Crow Distillery and Old Taylor Distillery

Ownership: Old Crow Distillery and Old Taylor Distillery, National Distillers Products Corp., Frankfort, Kentucky.
Source: Two springs, 8450-3805-1 and 8450-3805-2, in Woodford County; one well; and Kentucky River, 8450-3805-A, in Franklin County.
Well 8450-3805-3. Depth, 60 ft; diameter, 12 in.; water-bearing stratum, Quaternary alluvium; static water level, 50 ft below land surface.
Treatment: Chlorination.
Total distribution of water for average year: 680,400,000 gal.
Average daily pumpage: 1,864,000 gal.
From well and springs ..... 101,000 gal.
From surface ..... 1,763,000 gal.

Analysis, in parts per million, spring 8450-3805-1

(Collected June 3, 1952.)

Silica (SiO_2)	4.1	Fluoride (F)	0.2
Iron (Fe)	.57	Nitrate (NO_3)	4.0
Manganese (Mn)	.00	Dissolved solids	208
Calcium (Ca)	65	Hardness as $CaCO_3$	
Magnesium (Mg)	5.4	Total	184
Sodium (Na)	2.2	Noncarbonate	27
Potassium (K)	.8	Temperature (°F)	-
Bicarbonate (HCO_3)	192	pH	7.9
Sulfate (SO_4)	17	Specific conductance at	
Chloride (Cl)	5.0	25°C (micromhos)	368

Analysis, in parts per million, spring 8450-3805-2

(Collected June 3, 1952.)

Silica (SiO_2)	6.1	Fluoride (F)	0.1
Iron (Fe)	.10	Nitrate (NO_3)	4.4
Manganese (Mn)	.00	Dissolved solids	266
Calcium (Ca)	89	Hardness as $CaCO_3$	
Magnesium (Mg)	2.4	Total	232
Sodium (Na)	4.9	Noncarbonate	29
Potassium (K)	1.6	Temperature (°F)	-
Bicarbonate (HCO_3)	248	pH	7.6
Sulfate (SO_4)	28	Specific conductance at	
Chloride (Cl)	5.5	25°C (micromhos)	447

Analysis, in parts per million, well 8450-3805-3

(Collected June 3, 1952.)

Silica (SiO_2)	10	Fluoride (F)	0.1
Iron (Fe)	2.7	Nitrate (NO_3)	2.4
Manganese (Mn)	1.1	Dissolved solids	260
Calcium (Ca)	75	Hardness as $CaCO_3$	
Magnesium (Mg)	8.6	Total	223
Sodium (Na)	3.0	Noncarbonate	18
Potassium (K)	.8	Temperature (°F)	-
Bicarbonate (HCO_3)	250	pH	7.5
Sulfate (SO_4)	12	Specific conductance at	
Chloride (Cl)	7.0	25°C (micromhos)	448

Midway

Population served: 900.
Ownership: Municipal.
Source: Two springs, 8440-3805-4 and 8440-3805-5; one well; and Lees Branch.
Well 8440-3805-3. Depth, 120 ft; diameter, 6 in.; date drilled, 1940; water-bearing stratum, Middle Ordovician rocks; static water level, 30-40 ft below land surface. Well is used only occasionally.
Treatment: Coagulation with alum and lime, rapid sand filtration, and chlorination. Plant is located on Dudley Street.
Capacity: 432,000 gpd.
Storage: 75,000 gal in elevated tank in center of town.
Total distribution of water for year 1950-51: 13,995,000 gal.
Maximum monthly ..... June 1950 ..... 1,134,000 gal.
Minimum monthly ..... January 1951 ..... 968,000 gal.
Average daily pumpage: 38,000 gal.

Analysis, in parts per million, spring 8440-3805-5

(Collected Aug. 23, 1951.)

Silica (SiO_2)	8.8	Fluoride (F)	0.2
Iron (Fe)	.37	Nitrate (NO_3)	15
Manganese (Mn)	.00	Dissolved solids	254
Calcium (Ca)	81	Hardness as $CaCO_3$	
Magnesium (Mg)	6.3	Total	228
Sodium (Na)	1.6	Noncarbonate	28
Potassium (K)	.9	Temperature (°F)	56
Carbonate (CO_3)	8	pH	8.0
Bicarbonate (HCO_3)	228	Specific conductance at 25°C (micromhos)	430
Sulfate (SO_4)	16		
Chloride (Cl)	2.6		

Midway, Kentucky Female Orphanage

Population served: 270.
Ownership: Kentucky Female Orphanage, Commonwealth of Kentucky.
Source: One well and from town of Midway.
Well 8440-3805-6. Depth, 50 ft; diameter, 8 in.; date drilled, 1922; water-bearing stratum, Middle Ordovician rocks; static water level, 16 ft below land surface; yield, 100 gpm.
Treatment: Chlorination.
Storage: 55,000 gal in elevated tank.
Total distribution of water for average year: 20,000,000 gal.
Average daily pumpage: 55,000 gal.

Analysis, in parts per million, well 8440-3805-6

(Collected Sept. 18, 1951.)

Silica (SiO_2)	8.7	Fluoride (F)	0.0
Iron (Fe)	.19	Nitrate (NO_3)	5.1
Manganese (Mn)	.00	Dissolved solids	255
Calcium (Ca)	78	Hardness as $CaCO_3$	
Magnesium (Mg)	8.3	Total	228
Sodium (Na)	3.8	Noncarbonate	30
Potassium (K)	.5	Temperature (°F)	63
Bicarbonate (HCO_3)	242	pH	7.7
Sulfate (SO_4)	24	Specific conductance at 25°C (micromhos)	433
Chloride (Cl)	5.0		

Midway, Park & Tilford Distillers Corp.

Ownership: Park & Tilford Distillers Corp.
Source: Two wells; Lees Branch, 8440-3805-A; and town of Midway.
Well 8440-3805-1. Depth, 160 ft; diameter, 8 in.; date drilled, before 1925; water-bearing stratum, Middle Ordovician rocks; static water level, 20 ft below land surface.
Well 8440-3805-2. Depth, 90 ft; water-bearing stratum, Middle Ordovician rocks; static water level, 20 ft below land surface.
Treatment: Commercial boiler-water treatment.

Millville, Labrot & Graham Distillery

Ownership: Labrot & Graham Distillery, Brown-Forman Distillers Corp.
Source: Six wells; one spring, 8445-3805-7; and Grassy Springs Branch, 8445-3805-A.
Well 8445-3805-1. Depth, 116.5 ft; diameter, 8 in.; date drilled, 1945; water-bearing stratum, Middle Ordovician rocks; static water level, 60 ft below land surface; yield, 50 gpm.
Well 8445-3805-2. Depth, 105 ft; diameter, 8 in.; date drilled, before 1933; water-bearing stratum, Middle Ordovician rocks.
Well 8445-3805-3. Depth, 92.5 ft; diameter, 8 in.; date drilled, October 1946; water-bearing stratum, Middle Ordovician rocks; static water level, 60 ft below land surface.
Well 8445-3805-4. Depth, 62 ft; diameter, 5 in.; date drilled, before 1920; water-bearing stratum, Middle Ordovician rocks.
Well 8445-3805-5. Depth, 86 ft; diameter, 5 in.; date drilled, before 1920; water-bearing stratum, Middle Ordovician rocks; static water level, 50 ft below land surface.
Well 8445-3805-6. Depth, 89 ft; diameter, 8 in.; water-bearing stratum, Middle Ordovician rocks; static water level, 50 ft below land surface.
Treatment: Chlorination and charcoal filtration for drinking water.
Capacity: 160,000 gpd.
Average daily pumpage, when in operation: 30,000 gal.
From wells ..... 10,000 gal.
From surface ..... 20,000 gal.

Analysis, in parts per million, well 8445-3805-4

(Collected Sept. 19, 1951.)

Silica (SiO_2)	8.2	Fluoride (F)	0.4
Iron (Fe)	1.2	Nitrate (NO_3)	.4
Manganese (Mn)	.41	Dissolved solids	298
Calcium (Ca)	66	Hardness as $CaCO_3$	
Magnesium (Mg)	14	Total	224
Sodium (Na)	20	Noncarbonate	19
Potassium (K)	3.0	Temperature (°F)	60
Bicarbonate (HCO_3).....	248	pH	8.0
Sulfate (SO_4)	33	Specific conductance at	
Chloride (Cl)	26	25°C (micromhos)	509

Versailles

Population served: 3,055.
Ownership: Municipal.
Source: One well; one spring, 8440-3800-1; and Kentucky River, 6 miles west of town.
Well 8440-3800-2. Depth, 180 ft; diameter, 6 in.; water-bearing stratum, Middle Ordovician rocks; static water level, 20 ft below land surface; yield, 200 gpm.
Treatment: Coagulation with alum and lime, rapid sand filtration, activated carbon, and chlorination. Copper sulfate is used in summer to control algae. Plant is located behind city hall in the center of town.
Capacity: 576,000 gpd.
Storage: 365,000 gal in elevated tank in north end of town.
Total distribution of water for average year: 69,350,000 gal.
Maximum monthly ..... July ..... 9,000,000 gal.
Minimum monthly ..... January ..... 5,250,000 gal.
Average daily pumpage: 190,000 gal.

Analysis, in parts per million, well 8440-3800-2

(Collected Sept. 18, 1951.)

Silica (SiO_2)	6.6	Fluoride (F)	0.2
Iron (Fe)	.12	Nitrate (NO_3)	3.6
Manganese (Mn)	.00	Dissolved solids	309
Calcium (Ca)	85	Hardness as $CaCO_3$	
Magnesium (Mg)	14	Total	268
Sodium (Na)	4.7	Noncarbonate	57
Potassium (K)	.7	Temperature (°F)	55
Bicarbonate (HCO_3)	260	pH	7.7
Sulfate (SO_4)	46	Specific conductance at	
Chloride (Cl)	6.5	25°C (micromhos)	509

Analysis, in parts per million, spring 8440-3800-1

(Collected Sept. 18, 1951.)

Silica (SiO_2)	5.6	Fluoride (F)	0.0
Iron (Fe)	.47	Nitrate (NO_3)	4.0
Manganese (Mn)	.00	Dissolved solids	255
Calcium (Ca)	67	Hardness as $CaCO_3$	
Magnesium (Mg)	11	Total	212
Sodium (Na)	8.0	Noncarbonate	47
Potassium (K)	2.2	Temperature (°F)	62
Bicarbonate (HCO_3)	202	pH	8.0
Sulfate (SO_4)	45	Specific conductance at 25°C (micromhos)	432
Chloride (Cl)	12		

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