GEOLOGICAL SURVEY CIRCULAR 369

PUBLIC AND INDUSTRIAL WATER SUPPLIES OF THE EASTERN COAL FIELD 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
Thomas B. Nolan, Director

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ABSTRACT

About 115,100,000 gpd (gallons per day) of water is pumped for 119 large public and industrial water supplies in the 29 counties of the Eastern Coal Field region of Kentucky. About 12 percent of the water is used for public supply and about 88 percent for industrial supply. Public supplies provide 191,000 people with water, and per capita consumption ranges from 12 to possibly 460 gpd. The quantity of water pumped in a public supply for industrial use is sometimes more than half the total water provided. Industries in the region use water primarily for cooling. The largest amounts are used for coal washing, gas transmission, petroleum processing, railroad supply, and coal- and steel-products manufacture.

About 6 percent of the water pumped for public and industrial supplies is ground water and about 94 percent is surface water. However, of the total number of cities, industries, and institutions supplied, ground water provides 37 percent of the supply, surface water, 52 percent, and ground and surface water combined, 11 percent

Large ground-water supplies in the region are obtained principally from wells and abandoned coal mines but a few are obtained from springs. Wells yield from 2 to 330 gpm (gallons per minute) and get most of their water from sandstone in rocks of Pennsylvanian age and from sand and gravel in alluvium of Quaternary age. Most waters are of the calcium or magnesium bicarbonate or sodium bicarbonate type; many have a high iron content, and some have a large proportion of sulfate.

Most of the surface water pumped in the Eastern Coal Field is from the Big Sandy River and its tributaries, and from the Ohio River. In the future, surface water will be the principal source for towns and industries needing large quantities of water.

INTRODUCTION

Purpose and Scope of Report

To plan 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. Reports have been published for these regions: the Blue Grass (Palmquist and Hall, 1953), the Mississippian Plateau (Brown, 1954), the Western Coal Field (Maxwell, 1954), and the Jackson Purchase (Pree and Walker, 1953).

This report covers 29 counties in the Eastern Kentucky Coal Field region (fig. 1). The western margin of the area studied is drawn along county lines for convenience and does not exactly coincide with the natural physiographic boundary. The 29 counties have an area of 10,450 square miles or 26 percent of the area of the State.

Previous Investigations and Acknowledgments

Although some investigations of the geology and ground-water resources have been made in small areas in the Eastern Coal Field, this is the first study of the public and industrial water supplies of the whole region. Ashley (1905) described the water resources of the Middlesboro-Harlan area. A report by Fohs (1912) contains a short description of the occurrence of springs in Rockcastle County. Unpublished memoranda describe the ground-water supplies of the Clayton and Lambert Manufacturing Co. in Ashland, Ky. 1/, the city of Corbin, Ky. 2/, the area around London, Ky. 3/, and Cumberland Falls State Park, Ky. 4/ A brief memorandum describes the geology and occurrence of ground water

1/Guyton, W. F., and Hamilton, D. K., 1944, Memorandum on ground-water supply of the Clayton and Lambert Manufacturing Co., Ashland, Ky.: U. S. Geol. Survey and Kentucky Dept. Mines and Minerals, Geol. Div. (ms. rept).

2/Guyton, W. F., and Jones, D. J., 1944, Memorandum on water supply of Corbin, Ky.: U. S. Geol. Survey and Kentucky Dept. Mines and Minerals, Geol. Div. (ms. rept.).

3/Otton, E. G., 1948, Geology and ground-water resources of the London area, Ky.: Kentucky Dept. Mines and Minerals, Geol. Div. (duplicated rept.).

4/Guyton, W. F., and Jones, D. J., 1944, Memorandum on wells at Cumberland Falls State Park, Ky.: U. S. Geol. Survey and Kentucky Dept. Mines and Minerals, Geol. Div. (ms. rept.).

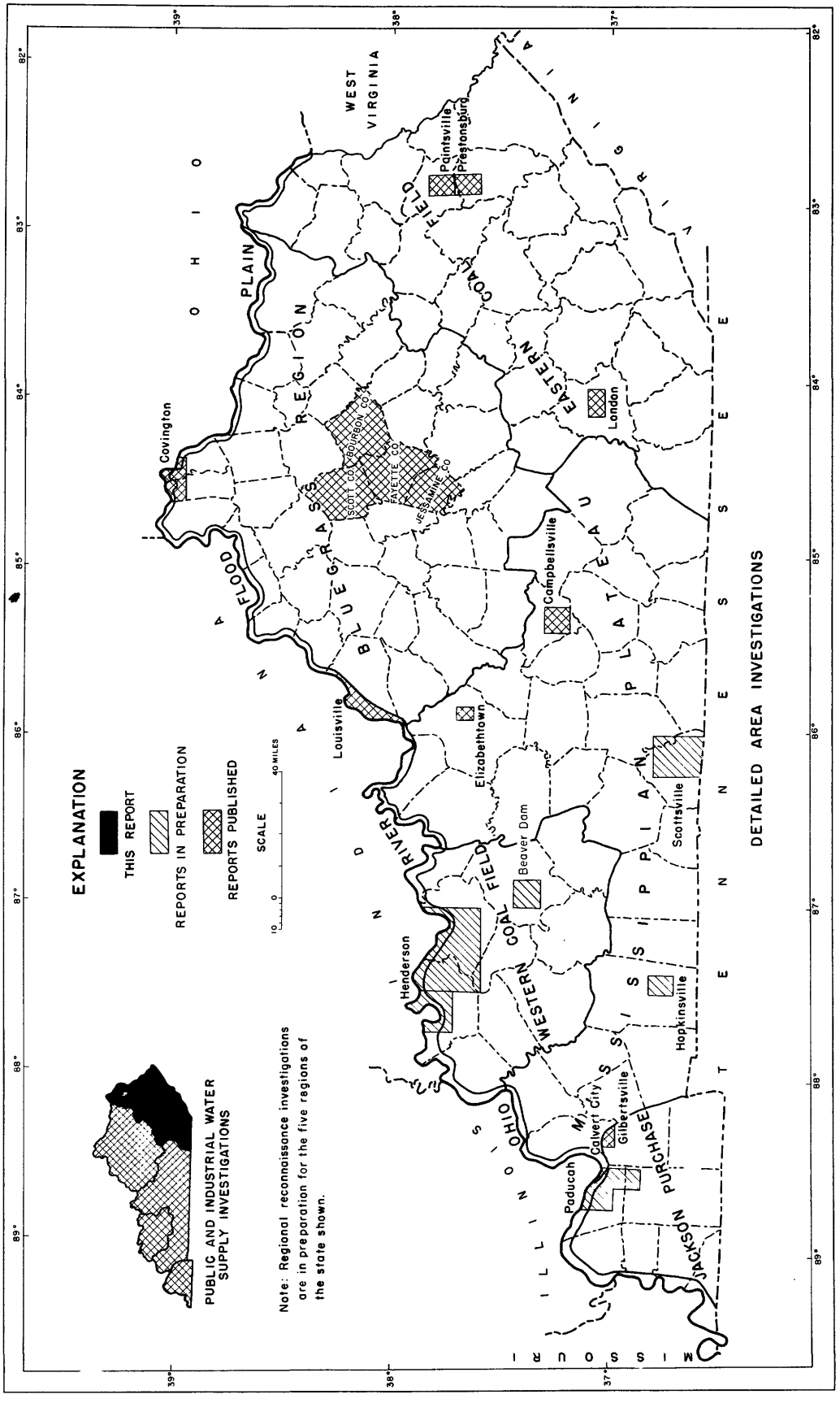


Figure 1.—Index map of Kentucky showing location of the area covered by this report and progress of ground-water investigations.

at Carter Caves State Park. 5/ A report by Lohr, Billingsley, Geurin, and Lamar (1952, p. 21–35) contains information on the municipal water supplies of Ashland and Middlesboro, the two largest cities in the area. Reports by Baker (1955) and Price (1955), describe the ground-water resources of the Paintsville and Prestonsburg areas respectively.

Appreciation is expressed to the owners, superintendents, and operators of the public and industrial water supplies for their cooperation in providing the data upon which this report is based.

Methods of Investigation and Presentation of Data

Data pertaining to the public and industrial water supplies covered in this report were obtained in 1950–53 by the authors directly from waterworks officials, plant engineers, and operators. Water samples were collected and sent for analysis to the Columbus, Ohio, labotatory of the United States Geological Survey.

The basic data obtained in this investigation are tabulated under the heading "Descriptions and analyses." These data are presented graphically on plates 1 and 2. Plate 1 shows the location, source, and pumpage in gallons per day of 119 public and industrial supplies. Plate 2 shows the quality of water of the ground-water supplies. Table 1 shows the cities, towns, and industries in the region using ground water, the population served, the water-bearing formations, and the pumpage. Table 2 shows similar information for cities and industries using surface water.

The ground-water investigations are under the general direction of A. N. Sayre, chief, Ground Water Branch, U. S. Geological Survey, Washington, D. C. The studies for this report were made under the immediate direction of M. I. Rorabaugh, former district engineer, Louisville, Ky. The fieldwork was done under the supervision of E. H. Walker and G. E. Hendrickson, geologists, and the report was written under the direction of Mr. Hendrickson. Chemical analyses were made in the U. S. Geological Survey laboratory at Columbus, Ohio, under the direction of W. L. Lamar, district chemist.

Water supplies described in this report are numbered and conform to the system used by the Ground Water Branch in Kentucky. The State is divided into rectangles bounded by 5-minute meridians of longitude and 5-minute parallels of latitude. Each well in a 5-minute rectangle has been assigned a number based on the longitude and latitude of the southeast corner. Well 8235–3825–20 at Ashland, for example, is the twentieth well numbered in the rectangle bounded on the east by longitude 82°35' and on the south by latitude 38°25'. 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 Pineville, the first to be inventoried in rectangle 8340–3645, is designated by the letter A.

5/Walker, E. H., 1950, Memorandum on ground-water supply, Carter Caves State Park, Ky.: U. S. Geol. Survey (ms. rept.).

GEOGRAPHY

Topography and Drainage

The Eastern Coal Field region, which includes part of the Cumberland and unglaciated Allegheny Plateaus and Cumberland Mountain section (Fenneman, 1938), is an area of rugged relief drained by an intricate network of streams. (See fig. 2.) The mountainous topography has profoundly influenced the cultural growth of the region.

Irregular narrow-crested ridges and deep winding valleys form the topography of the plateaus. There is but little level land in the region although small upland flats have developed on resistant sandstone, and valley bottoms, generally less than half a mile in width, have developed on weak shale outcrops. Ridges range from about 800 to more than 2,000 feet in altitude and bottom lands from about 550 to more than 1,000 feet. The Pottsville Escarpment, a rugged line of hills averaging 1,400 feet in altitude, forms the western boundary of the Eastern Coal Field. Topographic relief increases southeastward to Pine Mountain which forms the northwestern boundary of the Cumberland Mountain section.

The Cumberland Mountain section consists of two parallel ridges, Pine Mountain and Cumberland Mountain, ranging from about 2,000 to 3,000 feet in altitude and trending to the northeast. Between them lies the structural Middlesboro Basin, similar in topography to the Cumberland Plateau, but of greater relief. Here Black Mountain in Harlan County rises in "The Double" to 4,150 feet, the highest point in the State.

Rough terrain has slowed the growth of the region. The Pottsville Escarpment on the west and the Cumberland Mountain section on the east have acted as barriers to travel. Highways and railroads traversing the area have been difficult and expensive to construct and maintain. The Kentucky River and lower section of the Big Sandy River have been made navigable by the Government with locks and dams but are now little used for transportation. However, plans have been under consideration for canalization of the Big Sandy River in the hope that the carrying cost of coal will be reduced and greater quantities of water will be provided for industry.

The Eastern Coal Field is drained by six tributaries of the Ohio River. The Cumberland River drains the southern part of the area, the Kentucky and Licking Rivers drain the central part, the Big Sandy River drains the northeastern part, and the Little Sandy River and Tygarts Creek drain the northern part.

The Cumberland River rises near Whitesburg in Letcher County, then flows westward in an extremely winding course to enter the southeastern part of the Mississippian Plateau region. Principal tributaries in the Eastern Coal Field are the Laurel and Rockcastle Rivers.

The Kentucky and Licking Rivers drain the central part of the Eastern Coal Field. The Licking River rises near Salyersville in Magoffin County and flows northwestward into the Blue Grass region. The Kentucky River is formed by the confluence of the North Fork, usually considered its headwaters, and the middle fork near Beattyville in Lee County; the South Fork joins the

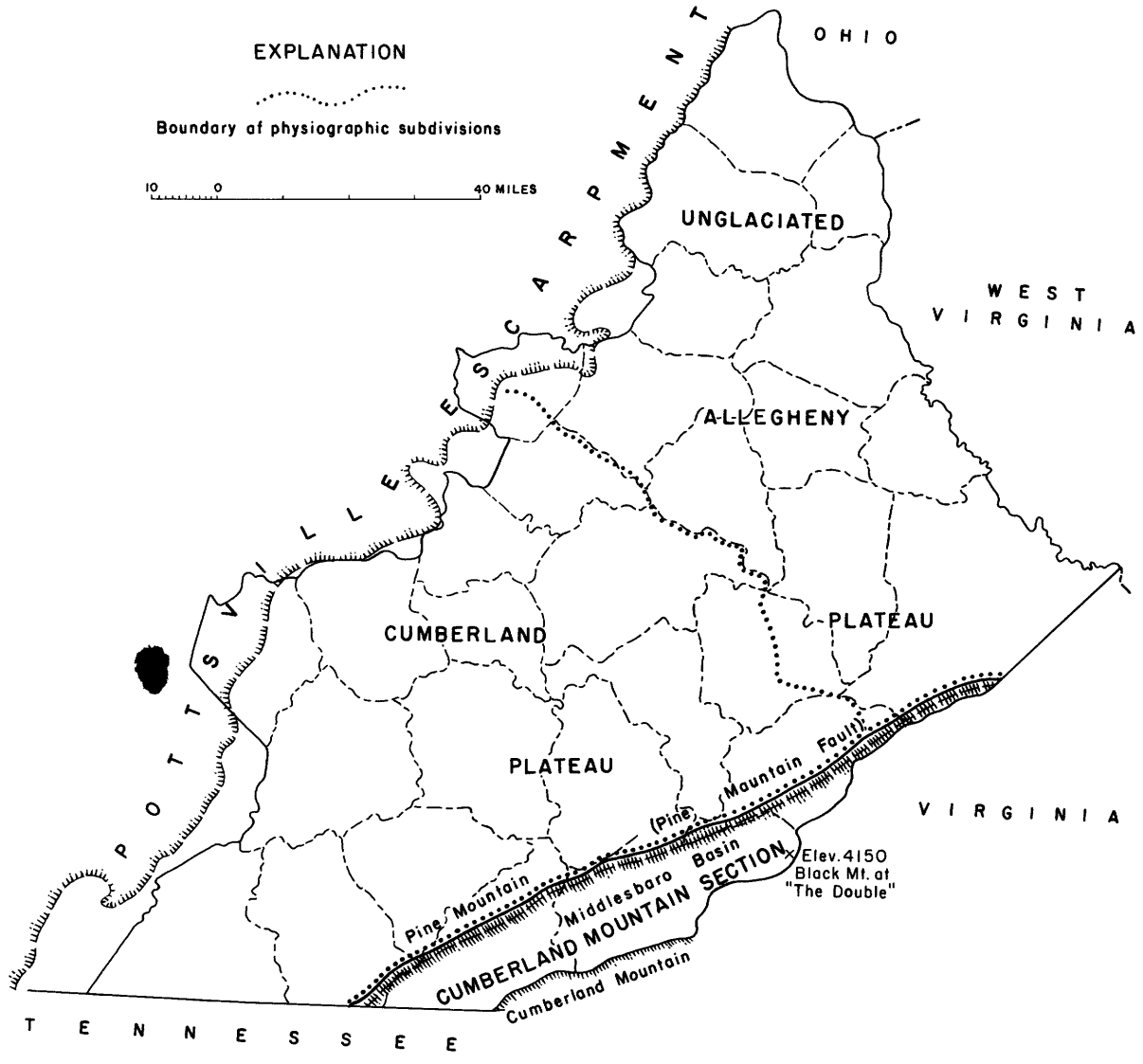


Figure 2.—Map of the Eastern Coal Field region showing physiographic subdivisions and major topographic features.

main river at Beattyville. The Kentucky River flows in a northwesterly direction from the mountains across a narrow strip of isolated hills known as the Knobs and into the Blue Grass region. The principal tributary to the Kentucky River in the Eastern Coal Field, in addition to the headwaters forks, is the Red River. The Kentucky River has been developed for navigation; 14 locks and dams provide a minimum depth of 6 feet from the mouth almost to Beattyville.

The Big Sandy River is formed by the confluence of the Levisa and Tug Forks at Louisa in Lawrence County. From Louisa the Big Sandy River flows northward to Catlettsburg where it joins the Ohio River. Levisa Fork, considered the headwaters of the Big Sandy River, rises in Virginia and flows northward through the Eastern Coal Field. Tug Fork also rises in Virginia and flows northward to form the boundary between Kentucky and West Virginia for 93 miles. The lower section of the river is improved for navigation with three locks and dams between Louisa and the mouth and one lock each on the Levisa and Tug Forks several miles upstream from Louisa.

The Little Sandy River and Tygarts Creek rise near Sandy Hook and the Rowan-Carter County line, respectively, and flow northeastward to join the Ohio River.

Climate

The climate of the region is moderate and humid. Records of the United States Weather Bureau station at Pikeville, Ky., from 1908 through 1952 indicate an average annual precipitation of 44 inches. A minimum of 23.87 inches was recorded in 1930 and a maximum of 59.24 inches in 1935. Seasonal variations in precipitation are small; the heaviest precipitation commonly falls during the summer and the lightest during the fall. The average annual temperature is about 58°F. Temperatures sometimes fall below zero during the winter and rise above 100° F during the summer. As the last killing frost occurs about April 25 and the first killing frost about October 15, the growing season is about 175 days long.

Population

The population of the region is 761,224 (1950 census), or 26 percent of the population of the State. Ashland and Middlesboro are the only cities of more than 10,000 persons in the area.

Rural Land Use

As most farming in the Eastern Coal Field is on a small-scale,subsistence basis, the area produces few commercial crops. Because the best farmland is in the valley bottoms, they are actively cultivated. Some crops are grown on the more gentle hillsides and upland flats, but these areas are not so productive as those containing alluvial soils. About 50 percent of the land is farmed, and both crops and livestock are raised. Corn is the leading crop; other products are hay, small grains, sorghum, vegetables, and tobacco. Cattle are the principal livestock raised, but there are some horses, sheep, hogs, and poultry. Local timber is cut and sawed at many small mills.

Mineral Resources and Industrial Growth

The industrial growth of the Eastern Coal Field has depended chiefly upon its mineral resources of coal, gas and oil, clay and claystone, sandstone, limestone, sand and gravel, and water.

Although coal is produced in all counties in the region, most of the production comes from Harlan, Pike, Letcher, Perry, Floyd, and Bell Counties. About 55 percent of the State's estimated coal reserves of 123 billion tons lies in eastern Kentucky. The coals are bituminous, highly volatile, and low in ash and sulfur content. Most of the coal is used for coking and the manufacture of coal gas.

The region contains many oil and gas fields. The principal production of oil has been from the Big Sinking Pool in Lee County and of gas from the Floyd-Pike County gas field. In 1951 eastern Kentucky produced 1,511,109 barrels of oil and 73,500,000,000 thousand cubic feet of gas. Secondary recovery of petroleum by waterflooding is proving successful and will extend the life of oil pools in eastern Kentucky.

Clay and claystone are being mined at several places in Boyd County, near Barbourville in Knox County, and near Olive Hill in Carter County. The mine near Olive Hill is the largest of these and produces three grades of very fine clay.

Sandstone has been quarried for building stone in Rockcastle and Johnson Counties, and for road material in many parts of the area. Sandstone also has been quarried for molding in Boyd and Carter Counties.

Limestone is quarried along the western margin of the Eastern Coal Field in Carter, Jackson, Lee, Morgan, and Rockcastle Counties and on Pine Mountain in Bell and Letcher Counties.

Sand and gravel used for construction purposes are obtained along the Ohio River, Big Sandy River, and other rivers and streams.

Water, an important mineral resource, is widely used for public and industrial purposes. Studies have been made (McGrain and Thomas, 1951) of the possibility of obtaining commercial brines, but the brines have not yet proved concentrated enough for use (McGrain, 1953).

Manufacturing and Processing Industries

Although the economy of the region depends chiefly upon farming, coal mining, and the production of oil and gas, there are many industries in the region manufacturing chemicals, leather products, steel products, clothing and fabrics, lumber and wood products, brick and tile, and ice. Numerous small industries also process food and beverages.

GEOLOGY

Stratigraphy

Consolidated rocks exposed in the Eastern Coal Field range from Devonian to Pennsylvanian in age. Alluvium of Quaternary age fills valleys cut in these older rocks. The principal geological formations in this area and their water-bearing characteristics are summarized below. Rocks of Ordovician and Silurian age may be

Generalized section of geologic formations in the Eastern Coal Field region, Ky.

System	Series	Formation		Thickness (feet)	Lithology	Water-bearing characteristics
		Northwest of Pine Mountain	Southeast of Pine Mountain			
Quaternary.	Recent and Pleistocene.	Alluvium.		0-97	Clay, silt, sand, and gravel.	Yields small quantities where material is fine grained, but as much as 330 gpm of moderately to very hard water to wells in the Ohio River valley.
Pennsylvanian.		Breathitt.	Undifferentiated.	0-2,500+	Sandstone, shale, coal seams; some thin or nodular limestone beds.	Yields from 2 to 300 gpm of water to wells and mines. Chemical character variable, but most waters contain objectionable amounts of iron.
		Lee.		100-1,400±	Massive conglomerate and sandstone with shale lentils and a few coal seams.	Yields from 2 to 200 gpm of water to wells, and possibly more than 280 gpm to one spring. Contains salty water in most places where not exposed but contains fresh water in outcrop areas.
Mississippian.		Undifferentiated.		555-1,280	Marine limestone, shale, and sandstone.	Yields fresh water to wells and springs in outcrop areas and salty water where overlain by younger formations.
Devonian.		Undifferentiated.		1,000±	Shale, dolomite, and limestone.	Yields salty water in most parts of the area.

exposed over a very small area in this region but are not important sources of water and are not included.

Rocks of Devonian age crop out along the western margin of the region and along the Pine Mountain fault. They consist mostly of shale, dolomite, and limestone, about 1,000 feet thick. Devonian strata do not furnish any water to large public or industrial supplies in the region.

Marine limestone, shale, and sandstone of Mississippian age crop out along the western margin of the region and along the Pine Mountain fault. The thickness of these strata ranges from 555 to 1,280 feet. These rocks provide water for three public and industrial supplies in the region.

The Lee formation, the oldest Pennsylvanian formation in the Eastern Coal Field, crops out in a broad area along the western margin of the region, in an uplift in the north-central part of the region, and along the ridgetops of Pine and Cumberland Mountains. The formation ranges in thickness from 100 to about 1,400 feet. As originally described (Campbell, 1893), the formation consists of three beds of massive sandstone or conglomerate separated by shale and thin sandstone, the whole including two to six seams of coal. The Lee formation is the source of seven public and industrial water supplies in the region.

The Breathitt formation is at the surface over most of the Eastern Coal Field and consists of alternating sequences of sandstone, shale, and coal seams. As no upper boundary has been defined for the formation, the term Breathitt used in this report includes all Pennsylvanian strata overlying the Lee formation northwest of Pine Mountain. Although the Breathitt formation has been entirely removed in some places, it is more than 2,500 feet thick in others. The Breathitt formation is the chief aquifer in the Eastern Coal Field and supplies water to 26 municipalities and industries.

Rocks equivalent stratigraphically to the Breathitt formation southeast of Pine Mountain have not been differentiated in this report and are classed as undifferentiated post-Lee Pennsylvanian rocks. These strata are similar in lithology and water-bearing characteristics to the Breathitt formation. They furnish water to 10 towns.

Alluvium of Quaternary age occupies valleys cut in the older formations. The alluvium consists of clay, silt, sand, and gravel as much as 97 feet thick. Nearly all the ground water pumped from this formation comes from the alluvium along the Ohio River. The alluvium provides water for 11 public and industrial supplies.

Structural Features

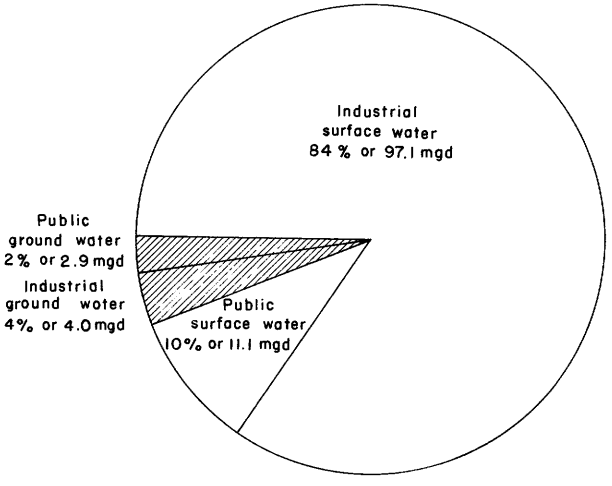
A large syncline, which forms the Cumberland Plateau in the Eastern Coal Field, is the principal structural feature of the region. Plunging gently to the northeast, this syncline is the southwestern extremity of a large oval basin in Ohio, West Virginia, and Pennsylvania. Trending northeastward in the northern part of the syncline is a zone of normal faulting and folding.

An elongated thrust block borders the syncline on the southeast and forms the Cumberland Mountain section of the Eastern Coal Field. The northeastward-trending Pine Mountain fault separates the Cumberland Plateau on the northwest from the Cumberland Mountain section on the southeast. The structure of the thrust block is synclinal, and the long axis of the syncline lies parallel to the Pine Mountain fault.

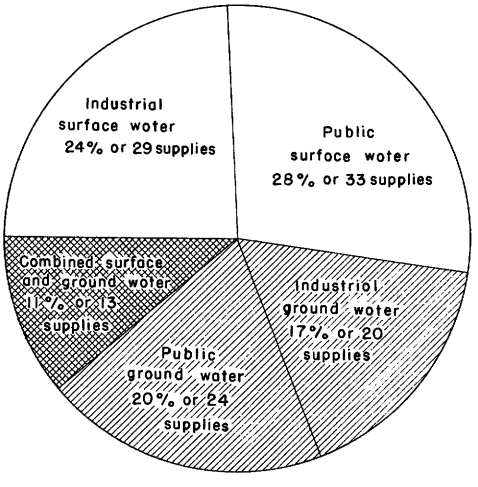
WATER RESOURCES

Utilization

Water is utilized in large quantities (10,000 gpd or more) by 60 cities and towns, and by 59 separate industries, institutions, and parks. Data were also collected on 45 smaller supplies and 2 steam plants. The average daily pumpage of water for large public and industrial supplies in this region is about 115,100,000 gallons. Public supplies use 12 percent of this total and industrial supplies use 88 percent. (See fig. 3.)



PUMPAGE IN MILLION GALLONS PER DAY BY PUBLIC AND INDUSTRIAL SUPPLIES USING GROUND WATER AND SURFACE WATER



NUMBER OF PUBLIC AND INDUSTRIAL SUPPLIES USING GROUND WATER, SURFACE WATER OR BOTH

Figure 3.—Water utilization and source in the Eastern Coal Field region, Kentucky.

Public and industrial water supplies using 10,000 gpd or more are listed in tables 1 and 2 and shown by block diagrams on plate 1. Water pumped by power-plants for generating steam is not shown in the block diagrams or included in the tables.

Table 1.—Pumpage and source of ground water for public and industrial supplies in the Eastern Coal Field region, Ky., 1950–53

[A, when in operation; S, uses surface water also, see table 2; those not public supplies shown by letter T. Total population does not include Benham or Jenkins which obtain most of their supply from surface water]

County	City	Owner	Population served	Water-bearing strata and pumpage (gallons per day)				
				Alluvium	Undifferentiated post-Lee Pennsylvanian rocks	Breathitt formation	Lee formation	Mississippian rocks
Bell	Cardinal	Kentucky Cardinal Coal Co.	80	.....	A10,000	.....	.....	.....
Do	Fonde	Clear Fork Coal Co.	210	.....	S12,000	.....	.....	.....
Do	Kettle Island	O. H. Viall Estate, Adventure Coal Corp. (lessee).	400	.....	.....	.....	.....	10,000
Do	Middlesboro	J. F. Schneider and Son, Inc. T.	.....	.....	.....	.....	S36,000	.....
Do	....do	U. S. Leather Co. T.	.....	.....	.....	.....	400,000	.....
Do	Pineville	Pineville Water Co	3,995	280,000	.....	.....	.....	.....
Boyd	Ashland	Ashland Home Ice Co. T.	.....	297,000	.....	.....	.....	.....
Do	....do	Federal Ice Co. T.	.....	216,000	.....	.....	.....	.....
Do	....do	Kentucky & West Virginia Power Co., Inc. T.	.....	432,000	.....	.....	.....	.....
Do	....do	A. C. Lawrence Leather Co. T.	.....	100,000	.....	300,000	.....	.....
Do	....do	Semet-Solvay Division of Allied Chemical and Dye Corp. T.	.....	S132,000	.....	.....	.....	.....
Do	Catlettsburg	United Fuel Gas Co. T.	.....	.....	.....	AS72,000	.....	.....
Breathitt	Evanston	Pond Creek Pocahontas Co.	185	.....	.....	123,000	.....	.....
Do	....do	United Electric Coal Co. T.	.....	.....	.....	A216,000	.....	.....
Floyd	David	Princess Elkhorn Coal Co. T.	.....	.....	.....	AS10,000	.....	.....
Do	Drift	Kentucky-West Virginia Gas Co. T.	.....	.....	.....	190,000	.....	.....
Do	Wayland	Beaver-Elkhorn Water District.	2,000	.....	.....	130,000	.....	.....
Do	Weeksbury	.....do.....	1,340	.....	.....	29,000	.....	.....
Do	Wheelwright	Inland Steel Co., Inc	2,200	.....	.....	373,000	.....	.....
Greenup	Greenup	Municipal	1,476	18,000	.....	.....	.....	.....
Do	Riverton	King Powder Co. T.	125	20,000	.....	.....	.....	.....
Do	Russell	Chesapeake & Ohio Railway Co. T.	.....	S78,000	.....	.....	.....	.....
Do	South Shore	South Shore Supply Co. (W. B. Hannah, owner; Portsmouth, Ohio).	1,575	97,000	.....	.....	.....	.....
Do	Wurtland	E. I. duPont de Nemours & Co., Inc. T.	.....	S12,000	.....	.....	.....	.....
Harlan	Alva	Black Star Coal Corp.	1,500	.....	S125,000	.....	.....	.....
Do	Benham	International Harvester Co.	3,000	.....	AS138,000	.....	.....	.....
Do	Brookside	Harlan Collieries Co.	400	.....	A38,000	.....	.....	.....
Do	Coalgood	Mary Helen Coal Co.	800	.....	30,000	.....	.....	.....
Do	Grays Knob	W. J. Simonton	620	.....	11,000	.....	.....	.....

Table 1.—Pumpage and source of ground water for public and industrial supplies in the Eastern Coal Field region, Ky., 1950–53—Continued

County	City	Owner	Population served	Water-bearing strata and pumpage (gallons per day)				
				Alluvium	Undifferentiated post-Lee Pennsylvanian rocks	Breathitt formation	Lee formation	Mississippian rocks
Harlan	Harlan	Chappell's Dairy T.			36,000			
Do.	Kenvir	Peabody Coal Co.	3,500		S94,000			
Do.	Kitts	Clover Fork Coal Co.	600		276,000(?)			
Knott	Anco	Knott Coal Corp. T.				70,000		
Do.	Hindman	Hindman Settlement School, Inc.	700			A12,000		
Leslie	Hyden	Leslie County High School.	880			A15,000		
Letcher	Deane	Consolidation Coal Co., (Ky.), Division of Pittsburgh Consolidation Coal Co. T.				A144,000		
Do.	Jenkins	do.				A864,000		
Do.	do.	Kentucky Water Co.	7,800			S272,000		
Do.	do.	Letcher Theater Corp. T.				A58,000		
Do.	Neon	Neon Water Co.	1,000			70,000		
Do.	Whitesburg	Municipal	1,533			100,000		
Magoffin	Oil Springs	Cumberland Petroleum Co. T.					34,000	
Do.	Salyersville	Municipal	1,174				28,000	
Do.	Wheelersburg	Brundred Oil Corp. T.					16,000	
Menifee	Frenchburg	Frenchburg Schools and Jane Cook Hospital.	480					11,000
Perry	Blue Diamond	Blue Diamond Coal Co.	2,336			81,000		
Do.	Harveyton	Harvey Coal Co.	560			37,000		
Do.	Leatherwood	Blue Diamond Coal Co.	2,150			S39,000		
Do.	Slemp	Louisville & Nashville Railroad Co. T.	10			20,000		
Pike	Alleghany	Hellier Coal and Coke Co. and Kentucky Fuel Co. T.	40			A182,000		
Do.	Esco	Utilities Elkhorn Coal Co.	20			A61,000		
Do.	Majestic	Majestic Collieries Co. T.	550			42,000		
Do.	Pikeville	Pikeville Ice Co. T.				34,000		
Do.	Stone	Eastern Coal Corp.	950			S362,000		
Rockcastle	Brodhead	Municipal	800					22,000
Whitley	Corbin	Citizens Ice and Fuel Co. T.					17,000	
Wolfe	Campton	Wolfe County High School.	575				A11,000	
Total			34,764	1,682,000	770,000	3,906,000	542,000	43,000

Table 2.—Pumpage of surface water for public and industrial supplies in the Eastern Coal Field region, Ky., 1950–53

[A, when in operation; G, uses ground water also, see table 1; U, pumpage unknown; those not public supplies shown by letter V. Total population does not include Kenvir or Stone which obtain most of their domestic supplies from ground water]

County	City	Owner	Population served	Pumpage (gpd)
Bell	Fonde	Clear Fork Coal Co. V.		G7,000
Do	Middlesboro	Kentucky Water Service Co., Inc	12,400	766,000
Do	do	J. F. Schneider & Son, Inc. V.		U
Do	Pineville	Louisville & Nashville Railroad Co. V.		60,000
Boyd	Ashland	Municipal	39,800	3,227,000
Do	do	American Rolling Mill Co. V.		29,000,000
Do	do	Semet-Solvay Division of Allied Chemical and Dye Corp. V.		G6,574,000
Do	Catlettsburg	Catlettsburg Kenova and Ceredo Water Co.	9,100	1,004,000
Do	do	Ashland Oil and Refining Co. V.		34,560,000
Do	do	Carbide & Carbon Chemical Corp. V.		3,718,000
Do	do	United Fuel Gas Co. V.		G3,744,000
Breathitt	Jackson	E. S. Mayes & Son, Springfield, Ky.	1,990	100,000
Do	do	Louisville & Nashville Railroad, Co. V.		175,000
Carter	Grayson	Municipal	1,325	82,000
Do	Olive Hill	Municipal	1,600	200,000
Clay	Garrard	Louisville & Nashville Railroad Co. V.		12,000
Do	Manchester	Municipal	1,745	121,000
Floyd	Allen	Allen Water Co	561	60,000
Do	Auxier	Claude Music	210	15,000
Do	David	Princess Elkhorn Coal Co	500	G29,000
Do	Dwale	Kentucky-West Virginia Gas Co. V.		1,000,000
Do	Garrett	William Francis	600	38,000
Do	Martin	Municipal	1,170	57,000
Do	do	Chesapeake & Ohio Railway Co. V.		91,000
Do	Maytown	Kentucky-West Virginia Gas Co. V.		360,000
Do	Prestonsburg	Municipal	3,630	203,000
Do	Price	Inland Steel Co., Inc. V.		A370,000
Do	Warco	United Fuels Gas Co. V.		60,000
Greenup	Load	Tennessee Gas & Transmission Co. V.	70	23,000
Do	Russell	Chesapeake & Ohio Railway Co. V.		G1,851,000
Do	Wurtland	E. I. duPont de Nemours & Co., Inc. V.		G480,000
Harlan	Alva	Black Star Coal Corp. V.		G192,000
Do	Benham	International Harvester Co	3,000	AG146,000
Do	Closplint	Closplint School Boosters Club	440	65,000
Do	Cumberland	Municipal	4,650	205,000
Do	do	Louisville & Nashville Railroad Co. V.		12,000
Do	Evarts	Municipal	2,060	36,000
Do	do	Louisville & Nashville Railroad Co. V.		12,000
Do	Harlan	Municipal	8,180	415,000
Do	Kenvir	Peabody Coal Co. V.	3,500	G2,806,000
Do	Loyall	Louisville & Nashville Railroad Co. V.		240,000
Do	Lynch	United States Steel Co	7,952	800,000
Jackson	Annville	Annville Institute V.	205	10,000
Johnson	Paintsville	Municipal	4,450	312,000
Do	do	Chesapeake & Ohio Railway Co. V.		235,000
Do	Van Lear	Kentucky Water Co., Jenkins, Ky.	1,146	70,000
Knott		Kentucky-West Virginia Gas Co. V.		864,000
Knox	Baileys	Louisville & Nashville Railroad Co. V.		A72,000
Do	Barbourville	Municipal	3,025	160,000
Do	do	Louisville & Nashville Railroad Co. V.		60,000
Laurel	London	Municipal	3,525	134,000
Lawrence	Louisa	Municipal	2,050	67,000
Lee	Beattyville	Municipal	1,042	54,000
Do	Leeco	Preston Oil Co. V.		27,000
Letcher	Jenkins	Kentucky Water Co	7,800	G467,000
Do	Neon	Louisville & Nashville Railroad Co. V.		13,000
Martin	Tomahawk	Kentucky-West Virginia Gas Co. V.		A360,000
Do	Warfield	Columbia Gas System of United Fuel Gas Co. V.		101,000

Table 2.—Pumpage of surface water for public and industrial supplies in the Eastern Coal Field region, Ky., 1950–53—Continued

County	City	Owner	Population served	Pumpage (gpd)
McCreary	Stearns	Stearns Coal and Lumber Co., Inc	1,210	16,000
Morgan	West Liberty	Municipal	970	60,000
Perry	Cornettsville	Louisville & Nashville Railroad Co. V		170,000
Do	Hazard	Municipal	9,800	882,000
Do	..do	Louisville & Nashville Railroad Co. V		100,000
Do	Leatherwood	Blue Diamond Coal Co. V		G288,000
Pike	Boldman	Atlantic Seabord Corp. V	30	8,642,000
Do	Elkhorn City	Municipal	1,349	60,000
Do	Freeburn	Freeburn Water Co	500	11,000
Do	Pikeville	Municipal	5,450	327,000
Do	Shelbiana	Chesapeake & Ohio Railway Co. V	150	162,000
Do	Stone	Eastern Coal Corp. V	950	G168,000
Rockcastle	Mount Vernon	Municipal	1,300	52,000
Whitley	Corbin	Municipal	8,460	613,000
Do	..do	Louisville & Nashville Railroad Co. V		500,000
Do		Cumberland Falls State Park		34,000
Do	Williamsburg	Municipal	3,355	166,000
Total			156,800	108,173,000

Water requirements in the region are varied. The quantity needed depends on the size of the town, industry, or institution, and on the type of industry. The quality of water supplied a town or institution must meet the standards for domestic use, but the requirements of industry depend entirely on how the water is used. In coal washing, for example, quantity of water is the only consideration, but in steam generation the water must meet definite standards of quality. Temperature also is important for some uses. When water is used for cooling, a low temperature is desirable; when it is used for generating steam, the temperature of the pumped water is not important. Some industries, such as the chemical industries, require water with a relatively constant temperature.

Factors such as quantity, quality, and temperature determine whether ground water or surface water is to be used. Ground water supplies 6 percent and surface water 94 percent of the water used for public and industrial purposes. However, 37 percent of all suppliers in the region use ground water, 52 percent use surface water, and 11 percent use a combination of both.

Public supply.—The 65 public water supplies listed in tables 1 and 2 serve 191,000 people (25 percent of the population of the region); the rate of consumption is 14 million gpd, or 73 gpd per person. Uses include domestic, industrial and commercial, and smaller amounts for schools, fire fighting, and public buildings. Surface water is used for 33 supplies, ground water for 24 supplies, and both ground and surface water for 8 supplies.

The average daily per capita water consumption from public supplies in this region ranges from 12 to possibly 460 gallons. Table 3 shows the daily per capita consumption of water in some towns and cities of the

Table 3.—Per capita use of water from some public supplies in the Eastern Coal Field region, Ky., 1950–53

City	Population served	Daily use of water per person (gallons)	Remarks
Ground-water supplies			
Alva	1,500	83	Separate surface-water supply for industrial use not included.
Brodhead	800	28	
Fonde	210	57	Separate surface-water supply for industrial use not included.
Greenup	1,476	12	
Harveyton	560	66	
Kitts	600	460	
Neon	1,000	70	
Pineville	3,995	70	
Salyersville	1,174	24	
Stone	950	381	Separate surface-water supply for industrial use not included.
Wayland	2,000	65	
Weeksbury	1,340	22	
Wheelwright	2,200	170	
Whitesburg	1,533	65	
Average, all cities using ground water		96	

Table 3.—Per capita use of water from some public supplies in the Eastern Coal Field region, Ky., 1950–53—Continued

City	Population served	Daily use of water per person (gallons)	Remarks
Surface-water supplies			
Allen	561	107	
Ashland	39,800	81	
Auxier	210	71	
Barbourville	3,025	53	
Beattyville	1,042	52	
Benham	3,000	48	Ground-water part of supply not included.
Catlettsburg	9,100	103	
Closplint	440	148	
Corbin	8,460	73	
Cumberland	4,650	44	
David	500	58	Separate ground-water supply for industrial use not included.
Elkhorn City	1,349	44	
Evarts	2,060	17	
Garrett	600	63	
Grayson	1,325	62	
Harlan	8,180	51	
Hazard	9,800	90	
Jackson	1,990	50	
Jenkins	7,800	60	Ground-water part of supply not included.
London	3,525	38	
Louisa	2,050	33	
Lynch	7,952	100	
Manchester	1,745	69	
Martin	1,170	49	
Middlesboro	12,400	62	
Mount Vernon	1,300	40	
Olive Hill	1,600	125	
Paintsville	4,450	70	
Prestonsburg	3,630	56	
Van Lear	1,146	61	
West Liberty	970	62	
Williamsburg	3,355	50	
Average, all cities using surface water		71	

Eastern Coal Field. Not listed in table 3 are figures for those towns whose total water consumption was computed wholly or partly by estimating the quantity used per person and then multiplying the result by the number of people in the community. In the majority of towns most of the water is used for domestic purposes, but in some towns more than half of the water is used for industrial purposes. The daily consumption of water for domestic purposes in some of the larger towns ranges from 17 to 64 gallons per person.

Air conditioning.—An office building in Ashland and a theater in Jenkins use water for air conditioning, largely during the summer months. Complete air conditioning regulates the purity, temperature, humidity, and movement of air in a building. Most of the water is used in removing heat; only a small quantity is used for increasing the humidity of the air or in cleaning it.

Water used in air conditioning must be noncorrosive, free of a tendency to form precipitates or slime, and preferably at a temperature of 60° F or colder. Wells supply 490,000 gpd to the two air-conditioned buildings at Ashland and Jenkins.

Chemical-products manufacture.—Two industries use water in the manufacture of chemicals and chemical products. A powder plant at Riverton uses water in the manufacture of explosives and for domestic purposes. A sulfuric acid plant at Wurtland uses 512,000 gpd of water for generating steam and for cooling. Of this amount, 32,000 gpd is pumped from wells and 480,000 gpd from the Ohio River.

Coal washing.—Seventeen coal-washing plants in the region use water to separate the coal from useless material such as shale and pyrite. The principal requirement for most coal-washing plants is an abundant supply of water. The quality and temperature of the water are not important.

Seven coal-washing plants in the area use water from wells, six from mines, three from streams, and one from both a stream and a well. Coal-washing plants use a total of 7,276,000 gpd. About 5,435,000 gpd is pumped from the streams, 1,196,000 gpd from the mines, and 645,000 gpd from the wells.

Food processing.—A packing plant at Middlesboro and a dairy at Harlan use water for processing food. In general, water used in food processing should be low in iron and manganese, but some foods require soft water. The two plants each use about 36,000 gpd from wells. The packing company also uses an unknown quantity of surface water.

Gas transmission.—Ten gas-transmission stations in the region use water for cooling compressor engines and condensers, and for other purposes. The stations pump a total of 15,155,000 gpd of water. Eight of the stations use surface water, one uses ground water, and one uses ground and surface water. Streams supply 14,893,000 gpd to the stations, and wells supply 262,000 gpd.

Ice manufacture.—Five plants in the region use water to manufacture ice. The water is used to make the ice itself and to cool compressors. Water used in making ice should be as cool as possible and low in content of dissolved minerals, such as iron, silica, manganese, carbonate, and sulfate. Carbonate and sulfate if present in water containing calcium, may cause cloudiness in the ice core. Ice plants in the area pump 564,000 gpd of water from wells.

Leather-products manufacture.—Two companies in the region use ground water to tan and manufacture leather products. Tanning requires water low in iron and manganese. A plant is Ashland uses 400,000 gpd from wells, and one in Middlesboro uses 400,000 gpd from a spring.

Petroleum processing and coal-products manufacture.—Four companies in the region use water in the manufacture of petroleum and coal products. A refinery at Catlettsburg uses water for condensing or cooling in the manufacture of petroleum products. A plant at Catlettsburg uses water for cooling condensers and compressor engines in the manufacture of natural gas concentrates. A plant at Ashland uses water in the manufacture of coke and coal byproducts. A coal and coke plant at Alleghany uses water for quenching coke. The four companies use a total of about 45,098,000 gpd of water. Of this amount, 44,853,000 gpd is pumped from streams, 132,000 gpd is pumped from wells, and about 113,000 gpd is pumped from a mine.

Power production.—Steam plants at Fourmile and Lothair use water to produce power. Another plant at Stearns pumps water to produce power and supply the town. Because most of the water pumped for power production is used for cooling condensers, it should be available in large quantities, soft, noncorrosive, free of a tendency to form slime, and cool. The water is returned to its source with no change except an increase in temperature. Therefore, the amount of water pumped for this purpose has not been included in the tables or computations given in this report.

Railroad supply.—Almost all the water pumped for the 17 large railroad supplies in the region is used to generate steam in locomotives. Domestic and other uses account for only a small amount of this supply. Of the supplies inventoried, 13 belong to the Louisville and Nashville Railroad Co. and 4 to the Chesapeake and Ohio Railway Co. Water used for boiler feed should be low in silica and bicarbonate content, and should contain only a small amount of sodium chloride and other soluble salts that may cause foaming and priming in the boiler. The water also should be soft and noncorrosive. The two railroads use about 3,963,000 gpd. Of this amount, 3,865,000 gpd is pumped from streams and 98,000 gpd from wells.

Secondary recovery of oil.—Three companies in the region use water in the secondary recovery of oil; they are near Oil Springs, at Wheelersburg, and at Leeco. Water or gas injected into an oil-bearing formation increases the production of wells tapping that formation by restoring the volume and pressure lost through natural production and by driving the oil toward the producing wells.

Water used in secondary-recovery operations should not form precipitates either in the injection system or in the formation, and should be sterile, constant in quality, and available in sufficient quantities. Water that does not form precipitates in the injection system or on mixture with the formation fluid can be a brine similar to that in the producing formation, a soft water of low mineral content, or a water that can be treated to eliminate or stabilize compounds that precipitate easily.

Sterile water prevents organic growths from hindering or stopping the injection of water. Most brines are sterile and require no treatment, but fresh water often must be chlorinated and may require softening and filtration. The advantage of using a brine, on the other hand, is somewhat offset by its greater corrosiveness. Because water constant in quality can be used in automatic treatment plants, ground water is preferable to surface water.

Water must be available in sufficient quantity to ensure a high rate of injection; temporary shutdowns lower the rate of injection and reduce the operating efficiency. Secondary-recovery operations in the area use 77,000 gpd of water. Two companies use 50,000 gpd of water from wells and one company uses 27,000 gpd from a stream.

Steel-products manufacture.—A rolling mill at Ashland pumps 29 million gpd from the Ohio River for steam generation and cooling in the manufacture of sheet steel.

Institutional supply.—Five schools and hospitals pump large quantities of water. The water is used to supply students, teachers, and hospital personnel. Water-quality requirements are the same as those for domestic use. The institutions pump a total of 59,000 gpd. An impounding reservoir supplies 10,000 gpd, and wells 49,000 gpd.

State parks supply.—Of the three State parks in the region, the Cumberland Falls State Park is the only one using large quantities of water. Water supplies for State parks should meet the requirements for domestic use and should be adequate to provide for tourists during the peak of the season. Cumberland Falls State Park pumps 34,000 gpd from the Cumberland River.

Quality of Water

The data on chemical quality relate primarily to the analyses of individual sources of raw water from wells and springs. The 64 samples of ground water and 4 samples of surface water were analyzed by the United States Geological Survey and the analyses are tabulated with other descriptive material under "Descriptions and analyses." Data on chemical quality of surface water in the region are presented in a report by Lamar and Laird (1953). The dissolved chemical constituents are reported in parts per million (ppm). A part per million is a unit weight of a constituent in a million unit weights of water. Results in parts per million can be converted to grains per United States gallon by multiplying by 0.0584. Natural waters contain silica, iron, calcium, magnesium, sodium, potassium, bicarbonate, sulfate, chloride, sometimes manganese and carbonate, and commonly nitrate and small amounts of fluoride. With the general exception of silica these constituents are in ionic solution. The ions of iron, manganese, calcium, magnesium, sodium, and potassium are called cations and carry positive electrical charges. The others are called anions and carry negative electrical charges.

The cations and anions in combination form chemical compounds. Ionic combinations are calculated from the combining or reacting capacity of the ions. For this purpose the ionic constituents may be reported in equivalents per million (epm). Equivalents per million is an expression of concentration in terms of the combining or reacting capacity of the ions. It is the number of unit equivalent weights of an ion contained in 1 million unit weights of water. For example, 1 equivalent of sodium (22.997 ppm) will combine exactly with 1 equivalent of chloride (35.457 ppm) to form 58.454 ppm of the compound sodium chloride (common salt). Equivalents may be used to calculate chemical combinations and to express analyses graphically as on plate 2. In the diagrams on plate 2, the equivalents for the cations in the left column and the equivalents for the anions in the right column are equal in height. In these diagrams equivalents for small quantities of fluoride and nitrate are included with that for chloride. When the nitrate is more than 10 ppm its equivalent is shown separately in solid black.

The hardness of water is reported as calcium carbonate ($CaCO_3$). Hardness in water is generally caused by compounds of calcium and magnesium. The results reported in the analyses show the hardness caused by these two constituents. The hardness caused by calcium and magnesium equivalent to the bicarbonate and carbonate 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 ranging from 0 to 60 ppm are considered soft; 61 to 120 ppm, moderately hard; 121 to 200 ppm, hard; and above 200 ppm, very hard.

The other characteristics of water reported are pH and specific conductance. The hydrogen-ion concentration is commonly reported in terms of pH. The pH is the negative logarithm of the number of moles of ionized hydrogen per liter of water. Determinations of pH are reported on a numerical scale extending from 1 to 14, 7.0 being neutral, less than 7.0 increasingly acidic, and greater than 7.0 increasingly alkaline. The specific conductance of water is a measure of the ability of the water to conduct a current of electricity. This ability is due to the dissolved constituents that ionize. The conductance varies with the concentration and degree of ionization of the constituents and with the temperature of the water. When considered in conjunction with the constituents, specific conductance is helpful in detecting changes in concentration of ionized substances in water. It is particularly useful in maintaining controls in industrial water supplies.

A water supply of good quality is valuable. For human consumption, water must be free from disease-causing bacteria. Color, taste, odor, and turbidity are visible or noticeable characteristics of water. These may be merely esthetic characteristics or they may be related to undesirable conditions. Water having these characteristics to an objectionable degree is not desirable in the home, in food and beverage processing, or in industry if it would affect the quality of the product.

Water for human consumption must not contain toxic substances in concentrations that would affect the health or well-being of the consumers. Toxic substances in water generally come from certain industrial wastes and are most likely to be found in surface waters polluted with these wastes. These include a variety of toxic substances such as arsenic, beryllium, cyanide, hexavalent chromium, fluoride, lead, and radioactive materials.

Of toxic substances commonly found in uncontaminated water, fluoride and nitrate are of particular significance. When water containing about 1.0 ppm of fluoride (F) is consumed regularly by children there is evidence that the incidence of dental caries (decay of teeth) is reduced (Dean, 1936); more than about 1.5 ppm of fluoride, however, may cause dental fluorosis, or mottling of tooth enamel (Dean, Jac, Arnold, and Elgrove, 1941). Water exceeding 45 ppm in nitrate (NO_3) content is generally regarded as unsafe for baby feeding, as it may cause infant cyanosis or "blue baby" (Maxcy, 1950). Infants under 6 months of age apparently are the most susceptible. Table 4 shows the general significance of the common chemical characteristics of natural waters.

For industrial use the significance of the characteristics of water is wide and varied. Some industries require water very low in dissolved solids, practically free from certain chemicals, and with specific physical and biological characteristics. In the domestic use of water, and also in several industrial uses, iron, manganese, and hardness are of particular significance. Iron and manganese in water make it unsuitable for many industrial processes. These constituents cause considerable annoyance in the home. They stain clothing, utensils, and bathroom fixtures and form deposits in water pipes and tanks. When iron is present in appreciable amounts, it oxidizes and precipitates, perhaps giving a muddy appearance to the water. To a lesser extent manganese also oxidizes, but the stain or precipitate is darker, and brown to black.

Hardness is a significant factor, and hard waters may be unsatisfactory for many industrial uses. Some industries require very soft water. Hardness is also troublesome in the home; it causes the wasting of soap, as may be seen in the "bathtub ring." Use of detergents to reduce this waste has increased greatly in recent years. Other adverse effects of the use of hard water are scaling and clogging of pipes, particularly

Table 4.—Source and significance of chemical constituents commonly found in 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 exchange material in 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 cause foaming in boilers and other difficulties in certain 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 scale on application of heat and releases 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 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 may give 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, but about 1.0 ppm reduces incidence of tooth decay.
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 nitrate may cause methemoglobinemia (infant cyanosis), sometimes fatal. Waters of high nitrate content should not be used for baby feeding.

hot-water pipes, hot-water tanks, and radiators. Many of the ground waters in this area are very hard. Although these hard waters may be used for domestic and public supply, they cannot be considered satisfactory without softening.

Corrosion causes extensive economic losses both in industry and in the home. Corrosion is related to the hydrogen-ion concentration of the water. The pH of water containing dissolved constituents will vary in accordance with the type and association of these constituents. With decreasing pH (increasing hydrogen-ion concentration) the water generally is progressively corrosive on metal surfaces. However, at noticeably high pH the corrosive activity on some metal surfaces may also accelerate. For example, at a very high pH the solubility of zinc surfaces is accelerated. It is usually necessary to maintain the pH above 8 to inhibit corrosion, but this does not mean that the water will then not have any corrosive activity. Dissolved gases such as oxygen and carbon dioxide are aggressive toward the more common metal surfaces.

The United States Public Health Service (1946) has established standards of quality for potable water used on interstate carriers. These standards in respect to chemical quality set an upper limit on the following constituents.

Constituent	Limit (parts per million)
Iron (Fe) and manganese (Mn)	0.3
Chromium (Cr), hexavalent	.05
Copper (Cu)	3.0
Lead (Pb)	.1
Zinc (Zn)	15
Arsenic (As)	.05
Selenium (Se)	.05

Constituent	Limit (parts per million)
Magnesium (Mg)	125
Sulfate (SO_4)	250
Chloride (Cl)	250
Fluoride (F)	1.5
Phenolic compounds (in terms of phenol)	.001
Dissolved solids	500 (1,000 permitted)

Ground Water

Ground water provides 21 percent of the water for public supplies and 4 percent of the water for industrial supplies in this region. Although there are no very large ground-water supplies in the area, ground water is nevertheless an important source of water for small communities and small industries. Ground water is generally less expensive to treat than surface water and is of more uniform quality and temperature.

Alluvium of Quaternary age and sandstone in the Breathitt formation or equivalent strata yield most of the water. Some supplies come from the Lee formation and a few from rocks of Mississippian age.

Wells, mines, and springs all yield water for public and industrial use in the area. The yield of wells in the area ranges from 2 to 330 gpm. Wells in the bedrock yield as much as 300 gpm and wells in the alluvium as much as 330 gpm. The yield of wells in the alluvium is generally greater than the yield of wells in the consolidated rocks. Three mines in the area yield 35, 100, and 150 gpm, respectively. One spring yields more than 280 gpm.

Although the chemical character of the ground water differs from place to place in the region, most waters are of the sodium bicarbonate or calcium magnesium bicarbonate type and contain undesirable amounts of iron. Most of the ground waters are moderately to very hard.

It is very difficult to predict yields or chemical character of well water in the region, particularly if the wells are in strata of Pennsylvanian age. Lateral changes in lithology in both the consolidated and unconsolidated rocks of the area, as well as the occurrence of joints in the hard rocks, make the prediction of well yield risky. Changes in the amount and types of materials in the rocks as well as the presence of possible sources of contamination also make any prediction of the chemical character of water uncertain. Therefore, the development of any ground-water supply, large or small, should be preceded by the careful collection and analysis of all available data.

Devonian and Mississippian rocks.—Rocks of Devonian and Mississippian age crop out along the western margin of the Eastern Coal Field and along the Pine Mountain fault. Elsewhere in the area they are overlain by younger rocks. Devonian rocks do not provide water for any large public or industrial supplies, but limestones and shales of Mississippian age yield about 43,000 gpd through springs and wells supplying two towns and two institutions.

Rocks of Mississippian age yield fresh water in their outcrop areas but may yield salty water at depths greater than 200 feet. The waters from two springs in limestone were analyzed and found to be of the calcium magnesium bicarbonate type. The waters had hardnesses of 53 and 160 ppm and contained 67 and 169 ppm of dissolved solids, respectively.

Lee formation.—The Lee formation crops out in a belt along the western margin of the Eastern Coal Field, along the ridges of Pine and Cumberland Mountains, and in the north-central part of the region near Paintsville. Sandstone in the Lee formation yields 542,000 gpd of water to 1 town, 5 industries, and 1 institution.

Reported yields of wells supplying industries and towns range from 2 to 200 gpm. A spring in the railroad tunnel through Cumberland Gap yields more than 280 gpm, probably from sandstone in the Lee formation.

The Lee formation yields fresh water where it crops out but generally yields salty water where overlain by younger strata. Nine samples collected from the formation were calcium magnesium bicarbonate and sodium bicarbonate waters. Hardness of the water ranged from 24 to 150 ppm and dissolved solids from 57 to 582 ppm.

Breathitt formation.—The outcrop area of the Breathitt formation, the principal aquifer of the region, covers most of the Eastern Coal Field. Sandstone and shale, the principal water-bearing rocks, supply 14 towns and 13 industries with 3,906,000 gpd. Both wells and mines supply water to towns and industries. Reported yields of wells range from about 2 to 300 gpm. Three mines yield 35, 100, and 150 gpm.

Although the Breathitt formation yields fresh water in most places, salty water is found at depths as shallow as 50 feet in some areas. Thirty-one samples taken from wells and mines indicate a wide range in the chemical quality of the water. However, sodium bicarbonate waters are the most common type, and many waters contain undesirable amounts of iron. Hardness of the waters ranges from 7 to 362 ppm and dissolved solids from 20 to 1,284 ppm.

Undifferentiated post-Lee Pennsylvanian rocks.—Undifferentiated post-Lee Pennsylvanian rocks occupy the structural trough southeast of Pine Mountain. Sandstones are the chief aquifers and yield most of the 770,000 gpd supplied to 9 towns and 1 industry. Yields of wells in these rocks range from 3 to 120 gpm.

The undifferentiated post-Lee Pennsylvanian rocks generally yield fresh water, but very deep wells may yield salty water. Thirteen chemical analyses made of waters from these strata indicate that they yield predominantly calcium magnesium bicarbonate and sodium bicarbonate waters containing undesirable amounts of iron. The samples ranged in hardness from 14 to 218 ppm and in dissolved solids from 158 to 798 ppm.

Alluvium.—Although the alluvium occupies the bottom of all the valleys cut in the consolidated rocks of the region, almost all the water pumped from the alluvium comes from sand and gravel along the Ohio River. Three towns and eight industries pump about 1,682,000 gpd, and yields of wells range from 50 to 330 gpm. Water from the alluvium is fresh, and eight samples

indicate that the most common type is a calcium magnesium sulfate water. The water ranges in hardness from 72 to 332 ppm and in dissolved solids from 151 to 570 ppm.

Surface Water

Surface water, which provides 79 percent of the water used for public supplies and 96 percent of the water used for industrial supplies, is the most important source in the region. Because no existing wells in the Eastern Coal Field yield more than a few hundred gallons per minute (although wells of larger yield might be drilled in the Ohio River valley) large water supplies must come from surface water. Some water is pumped from all the principal streams of the area, but most of the water comes from the Big Sandy River and its tributaries, and the Ohio River.

Knowledge of the quantities of water discharged by streams and the variations in their flow is important when any large use of the water is contemplated. Gaging stations for measuring stream flow in the area are maintained by the U. S. Geological Survey, and information on stream flow may be obtained directly from the Surface Water Branch, U. S. Geological Survey, 830 West Broadway, Louisville 3, Ky., or from the annual water-supply papers issued by the Geological Survey.

Although surface waters were not systematically sampled for this investigation, information is available on their quality. The Geological Survey maintains a surface-water quality sampling program in this region. Much of the information collected so far is presented in a publication by Lamar and Laird (1953). Additional data may be procured from the Quality of Water Branch, U. S. Geological Survey, 2822 East Main Street, Columbus 9, Ohio.

The following sections describe in more detail the area covered by the principal rivers and their tributaries in the region, the quantity of water pumped, and the general purpose for which it is used.

Cumberland River drainage.—The Cumberland River, together with its tributaries, drains the southwest part of the Eastern Coal Field, including all or parts of McCreary, Whitley, Laurel, Rockcastle, Jackson, Clay, Knox, Bell, Harlan, and Letcher Counties. Fourteen public and eleven industrial supplies pump 7,634,000 gpd from the Cumberland River and its tributaries.

Kentucky River drainage.—The Kentucky River, together with its tributaries, drains the southwest part of the Eastern Coal Field and includes all or parts of Knox, Clay, Leslie, Jackson, Owsley, Lee, Breathitt, Perry, Letcher, Knott, Wolfe, Morgan, and Menifee Counties. Four public and nine industrial supplies pump 2,419,000 gpd from the Kentucky River drainage area.

Licking River drainage.—The Licking River, in the northwest part of the Eastern Coal Field, drains all or most of Magoffin, Morgan, and Menifee Counties. One supply, that of West Liberty, pumps 60,000 gpd from the river.

Big Sandy River drainage.—The Big Sandy River, together with its tributaries, drains most of the northeastern part of the Eastern Coal Field, including all or parts of Pike, Knott, Floyd, Johnson, Morgan, Martin, Lawrence, and Boyd Counties. Twelve public and fifteen industrial supplies pump 56,553,000 gpd from the Big Sandy River drainage.

Little Sandy River drainage.—The Little Sandy River, in the northern part of the Eastern Coal Field, drains all of Elliott County and parts of Carter, Lawrence, Boyd, and Greenup Counties. The town of Grayson pumped 82,000 gpd of water from the Little Sandy River in 1950.

Tygarts Creek drainage.—Tygarts Creek, in the northern part of the Eastern Coal Field, drains part of Carter and Greenup Counties. Tygarts Creek drainage supplies about 223,000 gpd to a gas transmission company at Load and to the town of Olive Hill.

Ohio River.—The Ohio River borders the northern edge of the Eastern Coal Field. The city of Ashland and four large industries pump 41,132,000 gpd from the Ohio River.

DESCRIPTIONS AND ANALYSES

The following descriptions and analyses include detailed information on the water supply for each city, town, or industry inventoried. Both the counties and descriptions within each county are arranged alphabetically. The information for each supply is listed in the following order:

1. Name of county.
2. Name of city or town, and industry or institution.
3. Population served; in some towns the number of persons served was based on an average of 3.5 persons or more per meter.
4. Ownership of waterworks.
5. Source of supply, whether ground water or surface water, number and location of supply; for ground water, a brief description of the well, mine, or spring.
6. Description of treatment and location of treatment plant if not at the source.
7. Capacity of the treatment plant.
8. Storage reservoirs and tanks, whether for raw or finished water, and capacity and location.
9. Total distribution of water for year, usually 1951; in many instances this quantity was estimated.
10. Breakdown of annual distribution as to use; this includes water used for domestic, industrial and commercial, other public purposes, and water lost in leakage and waste.
11. Average pumpage in gallons per day; in many instances this quantity was estimated.
12. Chemical analyses of the water made by the U. S. Geological Survey.

BELL COUNTY

Cardinal

Population served: 80.
Ownership: Kentucky Cardinal Coal Co.
Source: One well, about 0.1 mile east of the Cardinal Post Office.
Well 8330–3645–2. Depth, 260 ft; diameter 8 to 6 in.; date drilled, July 1949; water-bearing strata, sandstone(?) in undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 39 ft below ground, July 1949; yield, 60 gpm.
Treatment: None.
Storage: 28,000 gal in two wooden tanks at Cardinal.
Total distribution of water for average year: 2,149,000 gal.
Breakdown of annual distribution as to use:
Domestic..... 329,000 gal
Industrial and commercial..... 1,820,000 gal
Average daily pumpage, when in operation: 10,000 gal.
Remarks: Most of the water is used for washing coal. The water is pumped from the well to the storage tanks, and flows from the tanks to the distribution system and coal-washing plant.

Analysis, in parts per million, well 8330–3645–2

(Collected Apr. 7, 1953)

Silica (SiO_2)	17
Iron (Fe)	12
Manganese (Mn)	.82
Calcium (Ca)	42
Magnesium (Mg)	26
Sodium (Na)	23
Potassium (K)	1.7
Bicarbonate (HCO_3)	73
Sulfate (SO_4)	183
Chloride (Cl)	10
Fluoride (F)	.2
Nitrate (NO_3)	1.0
Dissolved solids	346
Hardness as $CaCO_3$	
Total	212
Noncarbonate	152
Temperature (°F)	59
pH	7.4
Specific conductance at 25°C (micromhos)	519

Fonde

Population served: 210.
Ownership: Clear Fork Coal Co.
Source: Two wells, 0.2 mile east of the Fonde Post Office; Steve Creek, 1 mile southeast of the bathhouse and lighthouse.
Well 8350–3635–1 (standby). Depth, 267 or 400 ft; diameter, 3½ or 6 in.; date drilled, about 1917; water-bearing strata, "limestone" in undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 100 to 120 ft below ground.
Well 8350–3635–2. Depth, 600 ft; diameter, 4 in.; date drilled, about 1917; water-bearing strata, "limestone" or sandstone in undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 100 to 120 ft below ground; yield, 50 gpm.
Treatment: Chlorination (well water).
Storage: Raw water, 14,000 gal (from stream); finished water, 14,000 gal (from wells).
Total distribution of water for 1950 or 1951: 5,500,000 gal.
From stream..... 1,000,000 gal
From well..... 4,500,000 gal
Breakdown of annual distribution as to use:
Domestic..... 4,500,000 gal
Industrial and commercial..... 1,000,000 gal
Average daily pumpage, 1950 or 1951: 18,600 gal
From stream..... 7,000 gal
From well..... 12,000 gal
Remarks: Water from the well supplies the town of Fonde. Water from Steve Creek supplies the bathhouse and boiler. Water from the well is pumped into the upper storage tank, and flows by gravity through the distribution system. Water from Steve Creek flows by gravity into the lower storage tank, then to the bathhouse and boiler.

Analysis, in parts per million, well 8350–3635–2

(Collected Aug. 5, 1953)

Silica (SiO_2)	12
Iron (Fe)	.10
Manganese (Mn)	.00
Calcium (Ca)	6.9
Magnesium (Mg)	1.9
Sodium (Na)	312
Potassium (K)	3.7
Carbonate (CO_3)	0
Bicarbonate (HCO_3)	455
Sulfate (SO_4)	14
Chloride (Cl)	220
Fluoride (F)	.8
Nitrate (NO_3)	1.6
Dissolved solids	798
Hardness as $CaCO_3$	
Total	25
Noncarbonate	0
pH	7.4
Specific conductance at 25°C (micromhos)	1,410

Fourmile

Population served: 85.
Ownership: Kentucky Utilities Co.
Source: Cumberland River, 0.9 mile west of the Fourmile Post Office near U. S. 25E.
Treatment: Prechlorination; filtration; post-chlorination (domestic supply); coagulation with alum (occasional); chlorination; filtration; softening with zeolites; commercial boiler-water treatment.
Remarks: Most of the water is used for generating and condensing steam. The water is pumped from the river to a sump, and chlorinated; the domestic and boiler supply is pumped from the sump to the filters, then to storage tanks, and flows from the tanks to the distribution system.

Kettle Island

Population served: 400.
Ownership: O. H. Viall Estate; Adventure Coal Corp. (lessee).

Source: One spring on Pine Mountain, 1 mile southeast of Kettle Island.
Spring 8335–3645–1. Water-bearing strata, limestone of Mississippian age.
Treatment: None.
Total distribution of water for average year: 3,686,500 gal.
Breakdown of annual distribution as to use:
Domestic..... 3,293,000 gal
Industrial and commercial..... 393,500 gal
Average daily pumpage: 10,000 gal.
Remarks: Water flows from the spring to the distribution system.

Analysis, in parts per million, spring 8335–3645–1

(Collected Mar. 25, 1953)

Silica (SiO_2)	7.5
Iron (Fe)	.18
Manganese (Mn)	.00
Calcium (Ca)	18
Magnesium (Mg)	2.2
Sodium (Na)	.8
Potassium (K)	.2
Bicarbonate (HCO_3)	59
Sulfate (SO_4)	6.1
Chloride (Cl)	1.2
Fluoride (F)	.1
Nitrate (NO_3)	.5
Dissolved solids	67
Hardness as $CaCO_3$	
Total	53
Noncarbonate	6
Temperature (°F)	51
pH	7.6
Specific conductance at 25°C (micromhos)	112

Middlesboro

Population served: 12,400.
Ownership: Kentucky Water Service Co., Inc.
Source: Fern Lake, 1 mile south of Middlesboro.
Treatment: Chlorination.
Storage: 1,500,000 gal in a tank on Lake Hill.
Total distribution of water for 1950: 279,661,000 gal.
Maximum monthly (December).... 25,440,000 gal
Minimum monthly (March)..... 19,992,000 gal
Breakdown of annual distribution as to use:
Domestic..... 91,208,000 gal
Industrial and commercial..... 109,128,000 gal
Other public uses..... 16,855,000 gal
Leakage and waste..... 62,470,000 gal
Average daily pumpage, 1950: 766,000 gal.
Remarks: Water is pumped from Fern Lake to the Lake Hill tank, and flows by gravity to the distribution system.

Analysis, in parts per million, Fern Lake

(Collected May 11, 1951)

Silica (SiO_2)	5.3
Iron (Fe)	.73
Manganese (Mn)	.17
Calcium (Ca)	1.6
Magnesium (Mg)	1.0
Sodium (Na)	0.9
Potassium (K)	1.0
Carbonate (CO_3)	0
Bicarbonate (HCO_3)	8
Sulfate (SO_4)	4.0
Chloride (Cl)	.9
Fluoride (F)	.0
Nitrate (NO_3)	.1
Dissolved solids	19
Hardness as $CaCO_3$	
Total	12
pH	7.2
Specific conductance at 25°C (micromhos)	20.5

Middlesboro, J. F. Schneider & Son, Inc.

Ownership: J. F. Schneider & Son, Inc.
Source: Two wells at the J. F. Schneider & Son, Inc. packing plant on Brewery Road; a small tributary to Yellow Creek, 8340–3635–A, 0.4 mile southeast of the J. F. Schneider & Son, Inc. plant.
Well 8340–3635–3. Diameter, 8 in.; date drilled, about 1900; water-bearing strata, Lee formation(?); yield, 10 to 15 gpm.
Well 8340–3635–4. Diameter, 8 in.; date drilled, about 1900; water-bearing strata, Lee formation(?); yield, 10 to 15 gpm.
Treatment: None.
Storage: 1,500 gal behind the check dam and in a small reservoir by the dam; 25,200 gal in a tank below the reservoir and dam.
Total distribution of water for 1950:
From wells..... 13,100,000 gal
From stream..... unknown
Average daily pumpage, 1950:
From wells..... 36,000 gal
From stream..... unknown
Remarks: Water from the wells is used for cooling condensers. Water from the stream, impounded by a check dam, flows into a small reservoir, and from there into the tank. Water flows from the tank into the plant by gravity. Water from the wells flows by artesian pressure directly into the plant.

Analysis, in parts per million, wells 8340–3635–3, 4

(Collected July 18, 1952)

Silica (SiO_2)	7.1
Iron (Fe)	9.7
Manganese (Mn)	.45
Calcium (Ca)	16
Magnesium (Mg)	5.1
Sodium (Na)	.9
Potassium (K)	3.0
Carbonate (CO_3)	0
Bicarbonate (HCO_3)	50
Sulfate (SO_4)	24
Chloride (Cl)	.6
Fluoride (F)	.1
Nitrate (NO_3)	.1
Dissolved solids	87
Hardness as $CaCO_3$	
Total	60
Noncarbonate	20
Temperature (°F)	68
pH	6.4
Specific conductance at 25°C (micromhos)	142

Middlesboro, U. S. Leather Co.

Ownership: U. S. Leather Co.
Source: One spring in the Louisville & Nashville Railroad Co. tunnel through Cumberland Gap, 1.3 miles north of the Middlesboro Post Office.
Spring 8340–3635–5. Water-bearing strata, Lee formation(?); yield, 280+ gpm.
Treatment: None.
Storage: 6,000 gal in a tank near the spring, two 27,000- and two 22,000-gal tanks near the plant. A 150,000-gal tank and a 75,000-gal tank at the plant are used for the fire-sprinkler system.
Total distribution of water for 1950: 104,000,000 gal.
Average daily pumpage, 1950: 400,000 gal.
Remarks: The water is used for tanning. Water flows from the tunnel to the 6,000-gal tank, then is fed, partly by pump and partly by gravity, into the tanks near the plant. The water flows from these tanks into the plant.

Analysis, in parts per million, spring 8340–3635–5

(Collected Aug. 6, 1953)

Silica (SiO_2)	8.7
Iron (Fe)	.79
Manganese (Mn)	.05
Calcium (Ca)	13
Magnesium (Mg)	2.2
Sodium (Na)	1.1
Potassium (K)	1.1
Bicarbonate (HCO_3)	42
Sulfate (SO_4)	11
Chloride (Cl)	1.1
Fluoride (F)	.0
Nitrate (NO_3)	.6
Dissolved solids	57
Hardness as $CaCO_3$	
Total	43
Noncarbonate	7
Temperature (°F)	59
pH	6.8
Specific conductance at 25°C (micromhos)	97

Pineville

Population served: 3,995.
Ownership: Pineville Water Co.
Source: Two wells at the water plant on Park Avenue.
Well 8340–3635–2. Depth, 105 ft; diameter, 12 in.; date drilled, 1946; water-bearing strata, sand and gravel in alluvium of Quaternary age(?); yield, 200 gpm.
Well 8340–3635–3. Depth, 110 ft; diameter, 12 in.; date drilled, 1946; water-bearing strata, sand and gravel in alluvium of Quaternary age(?); yield, 200 gpm.
Treatment: Sedimentation; coagulation with alum and lime; sand filtration; chlorination.
Capacity of treatment plant: 750,000 gpd.
Storage: Finished water, 250,000 gal in a tank near the plant; 7,500 gal in a tank on Lowe's Hill; 12,000 gal in each of two tanks in the Highland subdivision; 25,000 gal in a tank at Wallsende; and about 25,000 gal in the clear well.
Total distribution of water for 1950: 102,000,000 gal.
Breakdown of annual distribution as to use:
Domestic..... 38,100,000 gal
Industrial and commercial..... 36,900,000 gal
Other public uses..... 11,700,000 gal
Leakage and waste..... 15,300,000 gal
Average daily pumpage, 1950: 280,000 gpd.
Remarks: The wells are pumped alternately. Water pumped from the well flows through the treatment plant, is pumped into the five reservoir tanks, and flows to the distribution system by gravity.

Pineville, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: Cumberland River, 8340–3645–A, 0.1 mile northwest of the railroad depot near State Route 66 in Pineville.
Treatment: Commercial boiler-water treatment.
Storage: Finished water, a 114,000-gal storage tank about 0.2 mile northwest of the railroad depot in Pineville.
Total distribution of water for average year: 21,900,000 gal.
Average daily pumpage: 60,000 gal.
Remarks: The water is used for generating steam in locomotives.

Stoney Fork

Population served: 170
Ownership: Ritter Lumber Co.
Source: One spring on Pine Mountain southeast of Stoney Fork (public supply); one well at Stoney Fork, and Stoney Fork (industrial supply).
Spring 8330–3645–3. Water-bearing strata, limestone of Mississippian age.
Well 8330–3645–4. Depth, 72 ft.
Treatment: Chlorination of spring water (occasional).
Storage: Raw water, 36,000 gal in four tanks.
Total distribution of water for average year: 3,285,000 gal.
Average daily pumpage, from spring: 9,000 gal.

BOYD COUNTY

Ashland

Population served: 31,800; Russell, Worthington, Flatwoods, Bellefonte, Westwood, and Raceland, 8,000; total, 39,800.
Ownership: Municipal.
Source: Ohio River near 40th Street in Ashland.
Treatment: Aeration; prechlorination; coagulation with alum and lime; ammoniation; the addition of activated carbon; sedimentation; rapid sand filtration; post-chlorination.
Capacity: 4,700,000 gpd.
Storage: Raw water, 25,000,000 gal in preliminary sedimentation basin near 39th Street; finished water, 6,500,000 gal in three elevated reservoirs and clear well.
Total distribution of water for 1950: 1,178,034,000 gal
Maximum monthly (August)..... 112,700,000 gal
Minimum monthly (February)..... 81,700,000 gal
Breakdown of annual distribution as to use:
Domestic..... 658,000,000 gal

Breakdown of annual distribution as to use—Continued
Industrial and commercial..... 363,400,000 gal
Other public uses, leakage, and waste..... 156,600,000 gal
Average daily pumpage, 1950: 3,227,000 gal.
Remarks: Water is pumped from the river to the sedimentation basin near 39th Street, and flows back to the plant by gravity. After being treated, the water is pumped into three reservoirs on hills, and flows by gravity to the distribution system.

Regular determinations at treatment plant, 1950

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	32	52	17	41	59	24
pH	7.0	7.7	6.2	8.3	8.7	7.2
Hardness as $CaCO_3$ (ppm)	90	156	43	107	170	72
Turbidity	176	2,000	25	.....	.....	.....

Analysis, in parts per million, finished Ohio River water

(Collected May 8, 1951)

Silica (SiO_2)	5.4
Iron (Fe)	.21
Manganese (Mn)	.00
Calcium (Ca)	26
Magnesium (Mg)	6.6
Sodium (Na)	10
Potassium (K)	1.5
Bicarbonate (HCO_3)	44
Sulfate (SO_4)	60
Chloride (Cl)	11
Fluoride (F)	.1
Nitrate (NO_3)	1.5
Dissolved solids	145
Hardness as $CaCO_3$	
Total	93
Noncarbonate	56
pH	7.2
Specific conductance at 25° C (micromhos)	245

Ashland, American Rolling Mill Co.

Ownership: American Rolling Mill Co.
Source: Ohio River, one intake (8235–3825–A) at West Works west of Ashland Corporation line, one intake (8235–3825–C) at 6th Street in Ashland, and one intake (8235–3825–D) at 22d Street in Ashland.
Treatment: Coagulation with alum and lime, softening with zeolites, filtration (West Works), chlorination for shower water.
Storage: Raw water, 25,000,000 gal in two ponds at the West Works; finished water, 1,010,000 gal in five elevated steel tanks and one concrete reservoir.
Total distribution of water for average year: 10,800,000,000 gal.
Average daily pumpage: 29,000,000 gal.
Remarks: Most of the water is used for steam generation and cooling. At the West Works, water is pumped from the river to two storage ponds, is pumped from the ponds through the treatment plant to four elevated storage tanks, and flows through the distribution system to the boilers. About 5,000 gpm of water is recirculated from the ponds to the boilers during the winter months, but no water is recirculated during the summer months. At the 6th Street and Norton Works, water is pumped from the river to the storage tanks and flows from the tanks to the cooling system and back to the river.

Regular determinations at treatment plant, 1951

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	28.6	54	10	25.1	46	8
pH	7.3	7.6	6.5	6.9	7.4	6.5
Hardness as $CaCO_3$ (ppm)	117	258	48	138	274	72
Turbidity	89.3	300	5	10.1	200	5

Ashland, Ashland Home Ice Co.

Ownership: Ashland Home Ice Co.
Source: Two wells at the Ashland Home Ice Co. plant at the corner of Greenup Avenue and 33d Street.
Well 8235–3825–16. Depth, 70 ft; diameter, 8 in.; date drilled, 1950; water-bearing strata, alluvium of Quaternary age; yield, 150 gpm.
Well 8235–3825–17. Depth 78 to 80 ft; diameter, 10 in.; date drilled, 1948; water-bearing strata, alluvium of Quaternary age(?); yield, 200 gpm.
Treatment: None.
Total distribution of water for 1950: 108,400,000 gal.
Average daily pumpage, 1950: 297,000 gal.
Remarks: The water is used for making ice and cooling condensers.

Analysis, in parts per million, well 8235–3825–16

(Collected Aug. 6, 1952)

Silica (SiO_2)	25
Iron (Fe)	.18
Manganese (Mn)	1.6
Calcium (Ca)	44
Magnesium (Mg)	17
Sodium (Na)	31
Potassium (K)	1.5
Bicarbonate (HCO_3)	54
Sulfate (SO_4)	119
Chloride (Cl)	41
Fluoride (F)	.1
Nitrate (NO_3)	27
Dissolved solids	326
Hardness as $CaCO_3$	
Total	182
Noncarbonate	135
Temperature (° F)	60
pH	6.1
Specific conductance at 25° C (micromhos)	531

Ashland, Federal Ice Co.

Ownership: Federal Ice Co.
Source: Three wells at the Federal Ice Co. plant, corner of Central Avenue and 22d Street.
Well 8235–3825–13. Depth, 82 ft; diameter, 8 in.; date drilled, 1948; water-bearing strata, alluvium of Quaternary age; yield, 150 gpm.
Well 8235–3825–14 (standby). Depth, 80 ft; diameter, 10(?) in.; water-bearing strata, alluvium of Quaternary age.
Well 8235–3825–15 (standby). Diameter, 8(?) in.; static water level, 54.48 ft below ground, July 17, 1951.
Treatment: None.
Total distribution of water for average year: 178,840,000 gal.
Average daily pumpage: 216,000 gal.
Remarks: The water is used for making ice and cooling condensers.

Analysis, in parts per million, well 8235–3825–13

(Collected Aug. 6, 1952)

Silica (SiO_2)	26
Iron (Fe)	.19
Manganese (Mn)	.00
Calcium (Ca)	64
Magnesium (Mg)	13
Sodium (Na)	34
Potassium (K)	2.9
Bicarbonate (HCO_3)	104
Sulfate (SO_4)	115
Chloride (Cl)	48
Fluoride (F)	.1
Nitrate (NO_3)	24
Dissolved solids	388
Hardness as $CaCO_3$	
Total	211
Noncarbonate	128
Temperature (°F)	58
pH	6.8
Specific conductance at 25°C (micromhos)	603

Ashland, Kentucky & West Virginia Power Co., Inc.

Ownership: Kentucky & West Virginia Power Co., Inc.
Source: One well in well house behind Kentucky & West Virginia Power Co. building, corner of Carter Avenue and 15th Street.
Well 8235–3825–11. Depth, 97 ft; diameter, 10 in.; date drilled, 1939; water-bearing strata, alluvium of Quaternary age(?); static water level, 60 to 70 ft below ground in spring of 1950; yield, 300 gpm.
Treatment: The addition of Calgon; chlorination.
Capacity: 432,000 gpd.
Total distribution of water for 1950: 79,500,000 gal.
Average daily pumpage, when in operation, 1950: 432,000 gal.
Remarks: The water is used for air conditioning.

Analysis, in parts per million, well 8235–3825–11

(Collected Oct. 16, 1953)

Silica (SiO_2)	19
Iron (Fe)	1.9
Manganese (Mn)	0.00
Calcium (Ca)	88
Magnesium (Mg)	19
Sodium (Na)	87
Potassium (K)	1.3
Bicarbonate (HCO_3)	208
Sulfate (SO_4)	95
Chloride (Cl)	152
Fluoride (F)	.0
Nitrate (NO_3)	15
Dissolved solids	569
Hardness as $CaCO_3$	
Total	300
Noncarbonate	127
Temperature (°F)	58
pH	7.1
Specific conductance at 25°C (micromhos)	1,010

Ashland, A. C. Lawrence Leather Co.

Ownership: A. C. Lawrence Leather Co.
Source: Three wells at the A. C. Lawrence Leather Co. plant.
Well 8235–3825–20. Depth, 225 ft; diameter, 10 in.; date drilled, 1927; water-bearing strata, Breathitt formation; static water level, 85 ft below ground; yield, 150 gpm.
Well 8235–3825–21. Depth, 225 ft; diameter, 10 in.; date drilled, 1927; water-bearing strata, Breathitt formation; static water level, 85 ft below ground; yield 150 gpm.
Well 8235–3825–22. Depth, 85 ft; diameter, 6 in.; date drilled, 1912; water-bearing strata, alluvium of Quaternary age(?); static water level, 80 ft below ground; yield, 150 gpm.
Treatment: None.
Storage: 92,000 gal in a reservoir and 23,000 gal in a tank, at the plant.
Total distribution of water for average year: 104,000,000 gal.
Average daily pumpage: 400,000 gal.
Remarks: Water is pumped from the wells to the reservoir, tank, and line. The tank forms additional storage, and water from the tank flows into the reservoir when needed. City water is used in the boilers.

Analysis, in parts per million, well 8235–3825–21

(Collected Aug. 6, 1952)

Silica (SiO_2)	22
Iron (Fe)	.25
Manganese (Mn)	.09
Calcium (Ca)	47
Magnesium (Mg)	20
Sodium (Na)	66
Potassium (K)	3.8
Bicarbonate (HCO_3)	45
Sulfate (SO_4)	112
Chloride (Cl)	112
Fluoride (F)	.0
Nitrate (NO_3)	30
Dissolved solids	436
Hardness as $CaCO_3$	
Total	202
Noncarbonate	163
Temperature (°F)	59
pH	6.3
Specific conductance at 25°C (micromhos)	763

Ashland, Semet-Solvay Division of Allied Chemical and Dye Corp.

Ownership: Semet-Solvay Division of Allied Chemical and Dye Corp.
Source: Four wells; Ohio River, 8235–3825–B, near 40th Street in Ashland.
Well 8235–3825–24, near ammonia storage tank at Semet-Solvay plant on 40th Street in Ashland. Depth, 70 ft; diameter, 12 in.; water-bearing strata, sand in alluvium of Quaternary age.
Well 8235–3825–25, at south side of ammonia storage tank at Semet-Solvay plant on 40th Street in Ashland. Depth, 70 ft; diameter, 12 in.; water-bearing strata, sand in alluvium of Quaternary age; static water level, 49 ft below ground on May 16, 1939; yield, (maximum after well cleaned out) 275 gpm; specific capacity, 38 gpm per foot of drawdown after 2 hr pumping at 230 gpm.
Well 8235–3825–26, at phenol plant at Semet-Solvay plant on 40th Street in Ashland. Depth, 70 ft; diameter, 12 in.; water-bearing strata, sand in alluvium of Quaternary age; yield, 200 to 225 gpm.
Well 8235–3825–27, near shell and tube cooler at Semet-Solvay plant on 40th Street in Ashland. Depth, 70 ft; diameter, 12 in.; water-bearing strata, sand in alluvium of Quaternary age; yield, 100 gpm.
Treatment: The addition of lime, soda ash, salt, and aluminate (boiler water).
Storage: Raw water, 50,000 gal in an elevated head tank.
Total distribution of water for 1951: 2,446,773,000 gal.
From river..... 2,399,593,000 gal
Maximum monthly (July)..... 236,038,000 gal
Minimum monthly (February) 177,648,000 gal
From wells..... 47,180,000 gal
Average daily pumpage, 1951: 706,000 gal.
From river..... 6,574,000 gal
From wells..... 132,000 gal
Remarks: Most of the water is used for cooling during the extraction of byproducts from coal. The well water is pumped from the wells directly into the distribution system. A new plant now under construction will substantially reduce the amount of water used. The river water is pumped to an elevated storage tank, and flows from the storage tank to the distribution system.

Average daily pumpage in gallons, by months, from Ohio River, 1951

January	6,300,000	July	7,610,000
February	6,340,000	August	6,910,000
March	6,110,000	September	6,230,000
April	6,250,000	October	6,240,000
May	6,940,000	November	6,040,000
June	7,450,000	December	6,400,000

Analysis, in parts per million, well 8235–3825–25

(Collected Jan. 6, 1953)

Silica (SiO_2)	19
Iron (Fe)	.87
Manganese (Mn)	1.6
Calcium (Ca)	101
Magnesium (Mg)	19
Sodium (Na)	71
Potassium (K)	2.4
Bicarbonate (HCO_3)	218
Sulfate (SO_4)	118
Chloride (Cl)	128
Fluoride (F)	.1
Nitrate (NO_3)	6.0
Dissolved solids	570
Hardness as $CaCO_3$	
Total	332
Noncarbonate	151
Temperature (° F)	60
pH	6.7
Specific conductance at 25° C (micromhos)	967

Catlettsburg

Population served: 4,800; Ceredo, West Virginia, 1,500; Kenova, West Virginia, 2,800; total, 9,100.
Ownership: Catlettsburg, Kenova, and Ceredo Water Co.
Source: Big Sandy River, at Valley Street in Catlettsburg.
Treatment: Coagulation with alum and lime; the addition of carbon (Nuchar); rapid sand filtration; chlorination.
Capacity: 2,000,000 gpd.
Storage: Finished water, 3,500,000 gal in the clear well and four reservoirs.
Total distribution of water for 1951: 366,583,000 gal.
Maximum monthly (July)..... 32,932,000 gal
Minimum monthly (April)..... 26,280,000 gal
Average daily pumpage, 1951: 1,004,000 gal.

Regular determinations at treatment plant, 1951–52

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	43.4	110	11	53	112	20
pH	7.3	7.9	6.5	8.9	9.0	8.0
Hardness as $CaCO_3$ (ppm)	92	175	30	110	170	12
Turbidity	115	1,000	25	.....	.....	.....
Temperature (° F)	66.5	88	40	.....	.....	.....

Average daily pumpage in gallons, by months, 1951

January	1,009,000	July	999,000
February	1,084,000	August	1,062,000
March	890,000	September	1,062,000
April	876,000	October	1,061,000
May	912,000	November	1,041,000
June	987,000	December	1,041,000

Catlettsburg, Ashland Oil and Refining Co.

Ownership: Ashland Oil and Refining Co.
Source: Big Sandy River; one intake (8235–3820–A) at

Source—Continued
Plant No. 2 on State Route 3, 1.1 miles south of U. S. 23; and one intake (8235–3820–B) at Plant No. 1 on State Route 3, south of U. S. 23. Auxiliary supply from Catlettsburg, Kenova, and Ceredo Water Co.
Treatment: The addition of lime, soda ash, and phosphate; filtration through anthrofelt (boiler water, Plant No. 1); softening with zeolites; the addition of phosphate (boiler water, Plant No. 2).
Storage: Raw water, 420,000 gal in one steel tank.
Total distribution of water for average year: 12,614,400,000 gal.
Average daily pumpage: 34,560,000 gal.
Remarks: Most of the water is used for condensing and cooling during the refining of petroleum. The water is pumped from the river to the distribution system and flows back to the river. About 4,500 to 5,000 gpm of water is recirculated in a closed system; about 150 gpm of water is used for makeup.

Catlettsburg, Carbide and Carbon Chemical Corp.

Ownership: Carbide and Carbon Chemical Corp.
Source: Big Sandy River, 8235–3820–C, on State Route 3 about 1.4 miles south of U. S. 23.
Treatment: Filtration; the addition of chromate (in closed system for compressors).
Storage: Raw water, 40,000 gal in an elevated steel tank; filtered water, 40,000 gal in an elevated steel tank.
Total distribution of water for 1951: 1,357,247,000 gal.
Average daily pumpage, 1951: 3,718,000 gal.
Remarks: Most of the water is used for condensing and for cooling compressor engines. The water used for condensing is pumped from the river to an elevated storage tank and flows from the tank through the condensers and back to the river. The water for cooling the engines is recirculated through a closed system and is cooled by water pumped from the river.

Catlettsburg, United Fuel Gas Co.

Ownership: United Fuel Gas Co.
Source: One well, at the plant; Big Sandy River, 8235–3820–D, on State Route 3 about 1.5 miles south of U. S. 23.
Well 8235–3820–1. Depth, 150 ft; diameter, 10 in.; water-bearing strata, Breathitt formation; yield, 50± gpm.
Treatment: The addition of alum; softening with zeolites; the addition of phosphate (boiler water).
Storage: Raw water, 560,000 gal in pond.
Total distribution of water for average year: 1,378,650,000 gal.
From river..... 1,370,000,000 gal
From well..... 8,650,000 gal
Average daily pumpage: 3,816,000 gal.
From river..... 3,744,000 gal
From well, when in operation.. 72,000 gal
Remarks: Most of the water is used for condensing and for cooling compressor engines. The well is used only during summer months. The water is pumped from the well to the condenser and mixed with river water. Part of the river water is pumped to the condenser, and part is pumped through cooling towers and flows from the towers to a pond. Water from the pond is pumped through the condensers and flows back to the river.

BREATHITT COUNTY

Evanston

Population served: 185.
Ownership: Pond Creek Pocahontas Co.
Source: Six wells.
Well 8300–3730–1 (serves 12 families), at Turner Court 0.3 mile east of the Evanston Post Office. Depth, 163 ft; diameter, 8 5/8 in.; date drilled, 1950; water-bearing strata, Breathitt formation.
Well 8300–3730–2 (serves 20 families), at employment office 150 ft northeast of the Evanston Post Office. Depth, 38 ft; diameter, 5 5/8 in.; water-bearing strata, Breathitt formation.
Well 8300–3730–4 (serves school), at school 0.4 mile south of the Evanston Post Office. Depth, 55 ft; diameter, 5 5/8 in.; date drilled, 1949; water-bearing strata, Breathitt formation.
Well 8300–3730–5 (serves 3 families), 3.3 miles south of the Evanston Post Office. Depth, 40 ft; diameter, 5 5/8 in.; date drilled, 1950; water-bearing strata, Breathitt formation.
Well 8300–3730–7 (industrial supply), at No. 3 Elkhorn coal-washing plant 3.8 miles south of the Evanston Post Office. Depth, 220 ft; diameter, 8 5/8 in.; date drilled, 1949; water-bearing strata, Breathitt formation; yield, 80 gpm.
Well 8300–3730–10 (serves 18 families and a bathhouse), at Foremen's Bottom 2.3 miles south of the Evanston Post Office. Depth, 102 ft; diameter, 8 5/8 in.; date drilled, 1950; water-bearing strata, Breathitt formation.
Treatment: None.
Storage: Raw water, 51,500 gal in one wooden tank at the coal-washing plant and five steel pressure tanks at the public supply wells.
Total distribution of water for average year: 31,193,200 gal.
Breakdown of annual distribution as to use:
Domestic..... 1,549,400 gal
Industrial..... 29,644,000 gal
Average daily pumpage: 123,000 gal.
Remarks: Well 8300–3730–7 is used for washing coal. Water is pumped from the well to the storage tank and flows from the tank to the coal-washing plant. Water is pumped from the public supply wells to steel pressure tanks and flows from these tanks to the distribution systems. Three wells not equipped with pumps could be used in emergency.

Analysis, in parts per million, well 8300–3730–7

(Collected July 30, 1952)

Silica (SiO_2)	14
Iron (Fe)	3.6
Manganese (Mn)	.73
Calcium (Ca)	59
Magnesium (Mg)	15
Sodium (Na)	116
Potassium (K)	3.8
Bicarbonate (HCO_3)	216
Sulfate (SO_4)	81
Chloride (Cl)	136
Fluoride (F)	.2
Nitrate (NO_3)	2.4
Dissolved solids	535
Hardness as $CaCO_3$	
Total	208

Analysis, in parts per million, well 8300–3730–7—Con.

Hardness as $CaCO_3$—Continued	
Noncarbonate	32
Temperature (° F)	57
pH	7.4
Specific conductance at 25° C (micromhos)	949

Evanston, United Electric Coal Co.

Ownership: United Electric Coal Co.
Source: Three wells.
Well 8300–3730–11, on State Route 542, 0.8 mile west of the Evanston Post Office. Depth, 225 ft; diameter, 8 in.; water-bearing strata, Breathitt formation.
Well 8300–3730–12, near State Route 542 at United Electric Coal Co. preparation plant, about 1 mile west of the Evanston Post Office. Depth, 217 ft; diameter, 8 5/8 in.; water-bearing strata, sandstone in the Breathitt formation; static water level 34.05 ft below ground, July 13, 1953; yield, 75(?) gpm.
Well 8300–3730–13, near State Route 542 at United Electric Coal Co. preparation plant, about 1 mile west of the Evanston Post Office and 10 ft west of well 8300–3730–12. Depth, 217 ft; diameter, 8 5/8 in.; water-bearing strata, Breathitt formation; yield, 75(?) gpm.
Treatment: None.
Storage: Raw water, 225,000 gal in two wooden tanks and one standpipe on a hillside.
Total distribution of water for average year: 54,000,000 gal.
Average daily pumpage, when in operation: 216,000 gal.
Remarks: The water is used for washing coal and for fire protection. Water from wells 8300–3730–12 and 13 is pumped to the storage tanks and flows from the tanks to the coal-washing plant. Water from well 8300–3730–11 is pumped to a steel collecting box and is pumped from the box to the coal-washing plant. Well 8300–3730–11 is pumped almost continuously when the plant is in operation, and wells 8300–3730–12 and 13 are pumped alternately when the plant is in operation.

Analysis, in parts per million, well 8300–3730–12

(Collected Sept. 30, 1952)

Silica (SiO_2)	13
Iron (Fe)	9.9
Manganese (Mn)	3.9
Calcium (Ca)	52
Magnesium (Mg)	15
Sodium (Na)	99
Potassium (K)	4.1
Bicarbonate (HCO_3)	213
Sulfate (SO_4)	128
Chloride (Cl)	75
Fluoride (F)	.2
Nitrate (NO_3)	3.2
Dissolved solids	509
Hardness as $CaCO_3$	
Total	194
Noncarbonate	17
Temperature (° F)	63
pH	6.8
Specific conductance at 25° C (micromhos)	841

Jackson

Population served: 1,990.
Ownership: E. S. Mayes & Son, Springfield, Ky.
Source: North Fork of the Kentucky River, 0.8 mile southeast of the Louisville & Nashville Railroad depot.
Treatment: Coagulation with alum and lime; rapid sand filtration, chlorination.
Capacity of treatment plant: 528,000 gpd.
Storage: 250,000 gal in the clear well and in two storage tanks on a hillside in northeast Jackson.
Total distribution of water for 1951: 36,504,000 gal.
Maximum monthly (August) 3,537,000 gal
Minimum monthly (March) 2,520,000 gal
Breakdown of annual distribution as to use:
Domestic 9,593,000 gal
Industrial and commercial 15,153,000 gal
Other public uses 1,939,000 gal
Leakage and waste 9,819,000 gal
Average daily pumpage, 1951: 100,000 gal.
Remarks: Water is pumped from the river to the treatment plant, flows through the plant to the clear well, and is pumped from the well to the distribution system and storage tanks.

Average daily pumpage in gallons, by months, 1951

January	100,000	July	110,000
February	108,000	August	114,000
March	81,000	September	103,000
April	97,000	October	98,000
May	88,000	November	105,000
June	98,000	December	96,000

Jackson, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: North Fork of the Kentucky River, 8320–3730–A, about 400 ft northwest of the depot.
Treatment: Coagulation with alum; the addition of sodium aluminate and potash; commercial boiler-water treatment.
Storage: 235,000 gal in one steel and one wooden tank at the treatment plant, one wooden tank about 0.7 mile east of the depot, and one wooden tank at Gentry about 3 miles west of Jackson.
Total distribution of water for average year: 63,875,000 gal.
Average daily pumpage: 175,000 gal.
Remarks: The water is used for steam generation in locomotives. The water is pumped from the river to the steel tank where it is treated, and flows from the steel tank to the three wooden storage tanks.

CARTER COUNTY

Carter Caves State Park

Population served: 120 (tourist).
Ownership: Carter Caves State Park, Commonwealth of Kentucky.
Source: Tygarts Creek, near State Route 182.
Treatment: Coagulation with alum and lime; chlorination; rapid sand filtration.
Storage: Finished water, 80,000 gal in one wooden and one steel tank.
Remarks: The water is pumped from the creek to the treatment plant, flows through the plant to the clear

Remarks—Continued
well, and is pumped from the well to the distribution system and storage tanks.

Grayson

Population served: 1,325.
Ownership: Municipal.
Source: Little Sandy River, 1 mile south of Grayson.
Treatment: Coagulation with alum and lime; filtration; chlorination.
Capacity of treatment plant: 360,000 gpd.
Storage: Finished water, 100,000 gal.
Total distribution of water for 1950: 29,954,000 gal.
Maximum monthly (December).... 2,882,000 gal
Minimum monthly (February).... 1,995,000 gal
Average daily pumpage, 1950: 82,000 gal.

Olive Hill

Population served: 1,600.
Ownership: Municipal.
Source: Tygarts Creek, impounded on Harbison-Walker Refractories Co. property in southwest part of Olive Hill.
Treatment: Coagulation with alum and lime; filtration; chlorination.
Capacity of treatment plant: 576,000 gpd.
Storage: Raw water, 57,000 gal; finished water, 200,000 gal in two tanks.
Total distribution of water for 1950: 73,000,000 gal.
Average daily pumpage, 1950: 200,000 gal.
Remarks: The present water supply is not adequate, but a new reservoir under construction will provide enough water to meet all needs.

Olive Hill, Chesapeake & Ohio Railway Co.

Ownership: Chesapeake & Ohio Railway Co.
Source: Tygarts Creek, 8310–3815–A, near the Chesapeake & Ohio Railway station in Olive Hill.
Treatment: The addition of soda ash to water in the engines.
Storage: One elevated tank.

CLAY COUNTY

Garrard, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: Goose Creek, 8340–3705–A, about 100 ft west of the Garrard Post Office.
Treatment: Commercial boiler-water treatment.
Storage: 63,000 gal in a wooden tank near the intake.
Total distribution of water for average year: 4,380,000 gal.
Average daily pumpage: 12,000 gal.
Remarks: The water is used for generating steam in locomotives.

Manchester

Population served: 1,745.
Ownership: Municipal.
Source: Goose Creek, in east Manchester.
Treatment: Coagulation with alum and lime; rapid sand filtration; chlorination.
Capacity of treatment plant: 312,000 gpd.
Storage: 161,000 gal in the clear well and a concrete storage tank located on a hillside northwest of Manchester.
Total distribution of water for 1951: 44,210,000 gal.
Maximum monthly (January)..... 4,437,000 gal
Minimum monthly (February).... 2,892,000 gal
Average daily pumpage, 1951: 121,000 gal.
Remarks: Water is pumped from the creek to the treatment plant, flows through the plant to the clear well, and is pumped from the well to the distribution system and storage tank.

Regular determinations at treatment plant, 1951

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	26.3	55	8	34.6	65	15
pH	6.9	8.8	6.4	7.0	8.9	6.9
Hardness as $CaCO_3$ (ppm)	44	78	18	74	114	48
Turbidity	49.7	600	25	.....	.....	.....

Average daily pumpage in gallons, by months, 1951

January	143,000	July	123,000
February	103,000	August	117,000
March	124,000	September	116,000
April	128,000	October	126,000
May	117,000	November	141,000
June	116,000	December	98,000

Oneida, Oneida Baptist Institute

Population served: 416.
Ownership: Oneida Baptist Institute.
Source: Goose Creek near the mouth of Red Bird River.
Treatment: Coagulation with alum and lime; filtration; chlorination.
Capacity of treatment plant: 31,200 gpd (approximate).
Storage: 125,000 gal in covered concrete reservoir.
Total distribution of water for average year: 3,000,000 gal.
Average daily pumpage: 8,000 gal.
Remarks: Water is pumped from the creek to the treatment plant, flows through the plant to the storage reservoir, and is pumped from the reservoir to the distribution system. A dug well furnishes water for the kitchen in emergencies.

Oneida, Oneida Maternity Hospital

Population served: 45.
Ownership: Oneida Maternity Hospital, Kentucky State Department of Health.
Source: South Fork of the Kentucky River.
Treatment: Coagulation with alum and lime; rapid sand filtration; chlorination.
Capacity of treatment plant: 24,000 gpd.
Storage: 36,000 gal in a buried concrete tank.
Total distribution of water for average year: 1,460,000 gal.
Average daily pumpage: 4,000 gal.

Remarks: Water is pumped from the river to the treatment plant, flows through the plant to the storage reservoir, is pumped from the reservoir to a pressure tank, and flows from the tank to the distribution system.

FLOYD COUNTY

Allen

Population served: 421; Dwale, 140; total, 561.
Ownership: Allen Water Co.
Source: Levisa Fork of the Big Sandy River, 1,100 ft north of the treatment plant.
Treatment: Coagulation with alum and lime; filtration; chlorination. The treatment plant is located on Railroad Street in Allen.
Capacity of treatment plant: 152,000 gpd.
Storage: 19,000 gal in the clear well and a steel tank on a hillside about 1,200 ft east of the treatment plant.
Total distribution of water for average year: 21,900,000 gal.
Average daily pumpage: 60,000 gal.

Auxier

Population served: 210.
Ownership: Mr. Claude Music.
Source: Levisa Fork of the Big Sandy River, near the old tram bridge at Auxier.
Treatment: Sedimentation; chlorination (occasional).
Storage: Raw water, 285,000 gal in a sedimentation basin, finished water, 20,000 gal in a tank on hill near town.
Total distribution of water for 1951: 5,475,000 gal.
Average daily pumpage, 1951: 15,000 gal.
Remarks: Water is pumped from the river to the sedimentation basin, and from the basin to the elevated tank. Water flows from the tank to the distribution system by gravity. Privately owned wells supply drinking and cooking water.

David

Population served: 500.
Ownership: Princess Elkhorn Coal Co.
Source: One mine, 0.2 mile east of the David Post Office (industrial supply). Impounding reservoir, half a mile west of the David Post Office (public supply).
Mine 8250–3735–62. Water-bearing strata, Breathitt formation; yield, 100± gpm.
Treatment: Coagulation with soda ash and alum; aeration; filtration; chlorination (public supply). The treatment plant is located near the reservoir.
Capacity of treatment plant: 104,000 gpd.
Storage: Raw water, 6,000,000 gal in impounding reservoir; finished water, 60,000 gal in a tank on a hillside at the treatment plant.
Total distribution of water for 1952: 12,808,400 gal.
From reservoir..... 10,408,400 gal
Maximum monthly (July)..... 1,170,000 gal
Minimum monthly (October) 751,000 gal
From mine..... 2,400,000 gal
Breakdown of annual distribution as to use:
Domestic..... 10,408,400 gal
Industrial..... 2,400,000 gal
Average daily pumpage, 1952: 39,000 gal.
From reservoir..... 29,000 gal
From mine, when in operation..... 10,000 gal
Remarks: The water from mine 8250–3735–62 is used for washing coal. The water for the public supply flows from the impounding reservoir to the treatment plant, is pumped from the plant to the settlement tank, flows from the tank through the treatment plant to the clear well, and is pumped from the well to the distribution system and the storage tank.

Average daily pumpage in gallons, by months, 1952 (from reservoir)

January	27,000	July	38,000
February	28,000	August	26,000
March	24,000	September	27,000
April	29,000	October	24,000
May	29,000	November	29,000
June	34,000	December	26,000

Analysis, in parts per million, mine 8250–3735–62

(Collected Aug. 25, 1953)

Silica (SiO_2)	7.9
Iron (Fe)	.18
Manganese (Mn)	.00
Calcium (Ca)	13
Magnesium (Mg)	5.0
Sodium (Na)	204
Potassium (K)	6.4
Carbonate (CO_3)	10
Bicarbonate (HCO_3)	218
Sulfate (SO_4)	198
Chloride (Cl)	61
Fluoride (F)	.4
Nitrate (NO_3)	21
Dissolved solids	628
Hardness as $CaCO_3$	
Total	53
Noncarbonate	0
Temperature (°F)	59
pH	8.0
Specific conductance at 25°C (micromhos)	1,030

Drift, Kentucky-West Virginia Gas Co.

Ownership: Kentucky-West Virginia Gas Co.
Source: Two wells.
Well 8240–3725–1, at the compressor station. Depth, 110 ft; diameter, 6 in.; water-bearing strata, sandstone(?) in the Breathitt formation; static water level, 20 ft below ground when drilled.
Well 8240–3725–2, at the mouth of Martin Branch, 750 ft west of the compressor station. Depth, 130 ft; diameter, 8 in.; water-bearing strata, Breathitt formation; yield, 132 gpm(?).
Treatment: None.
Storage: 21,000 gal in an elevated steel tank.
Total distribution of water for average year: 69,300,000 gal.
Average daily pumpage: 190,000 gal.
Remarks: The water is used for cooling compressor engines. A new cooling system under construction will utilize surface water and cooling towers. Much

Remarks—Continued
of the water will be recirculated when the new system is put into use.

Dwale, Kentucky-West Virginia Gas Co.

Ownership: Kentucky-West Virginia Gas Co.
Source: Levisa Fork of the Big Sandy River, 8240–3735-A, 0.3 mile north of the Dwale Post Office.
Treatment: Commercial boiler-water treatment (boiler water); the addition of Calgon and copper sulfate for algae control in the storage pond (circulation water).
Storage: 26,900,000 gal in pond.
Total distribution of water for average year: 365,000,000 gal.
Average daily pumpage: 1,000,000 gal.

Garrett

Population served: 600.
Ownership: Mr. William Francis.
Source: Right Fork of Beaver Creek, 0.3 mile south of the Garrett Post Office.
Treatment: Coagulation with alum and lime; filtration; chlorination.
Storage: 75,000 gal in the clear well and a wooden tank on a hillside east of the Garrett Post Office.
Total distribution of water for average year: 13,700,000 gal.
Average daily pumpage: 38,000 gal.
Remarks: Water is pumped from the creek to the treatment plant, flows through the plant to the clear well, is pumped from the well to the storage tank and flows from the tank to the distribution system.

Glo

Population served: 320.
Ownership: Glo Valley Coal Corp.
Source: One mine, west of Beaver Creek.
Mine 8245–3725–2. Water-bearing strata, Breathitt formation; yield, 35 gpm.
Treatment: None.
Storage: Raw water, 10,000 gal in a tank on a hillside.
Total distribution of water for average year: 1,825,000 gal.
Breakdown of annual distribution as to use:
Industrial and commercial..... 182,000 gal
Leakage and waste..... 1,643,000 gal
Average daily pumpage: 5,000 gal.
Remarks: The water is pumped into the tank continuously. At least 90 percent of the water overflows the tank and drains into nearby streams.

Martin

Population served: 1,170.
Ownership: Municipal.
Source: Right Fork of Beaver Creek, half a mile south of the center of town.
Treatment: Coagulation with alum and lime; filtration; fluoridation; chlorination.
Storage: 102,000 gal in the clear well and in a steel tank on hillside east of Martin.
Total distribution of water for average year: 20,800,000 gal.
Average daily pumpage: 57,000 gal.
Remarks: Water is pumped from the creek to the treatment plant, flows through the plant to the clear well, is pumped from the well to the storage tank and flows from the tank to the distribution system.

Martin, Chesapeake & Ohio Railway Co.

Ownership: Chesapeake & Ohio Railway Co.
Source: Right Fork of Beaver Creek, 8245–3730–B, about 300 ft northeast of the railroad station in Martin.
Treatment: Coagulation with soda ash, lime, and alum; the addition of nitrate; commercial boiler-water treatment.
Capacity of treatment plant: 576,000 gpd.
Storage: 280,000 gal in a standpipe at the plant.
Total distribution of water for 1951: 33,096,700 gal.
Maximum monthly (August).... 3,641,700 gal
Minimum monthly (January)... 2,103,900 gal
Average daily pumpage, 1951: 91,000 gal.
Remarks: The water is used for generating steam in locomotives. Water is pumped from the creek through the treatment plant to the standpipe, and flows from the standpipe to the locomotives.

Average daily pumpage in gallons, by months, 1951

January	68,000	July	79,000
February	75,000	August	118,000
March	80,000	September	97,000
April	78,000	October	105,000
May	84,000	November	107,000
June	97,000	December	98,000

Maytown (Post Office Langley), Kentucky-West Virginia Gas Co.

Ownership: Kentucky-West Virginia Gas Co.
Source: Right Fork of Beaver Creek, 8245–3730–C, 0.4 mile north of Maytown (Langley Post Office).
Treatment: None.
Storage: Raw water, 63,000 gal in one elevated wooden tank and one steel tank.
Total distribution of water for average year: 131,200,000 gal.
Average daily pumpage: 360,000 gal.

Prestonsburg

Population served: 3,630.
Ownership: Municipal.
Source: Levisa Fork of the Big Sandy River at Prestonsburg.
Treatment: Prechlorination; coagulation with alum and lime; postchlorination.
Capacity of treatment plant: 540,000 gpd.
Storage: Raw water, 87,000 gal in the sedimentation basin; finished water, 40,000 gal in the clear well and 150,000 gal in an elevated tank.
Total distribution of water for 1951: 74,000,000 gal.
Average daily pumpage for period of record, 1951: 203,000 gal.
Remarks: Water is pumped from the river to the treatment plant, flows through the plant to the clear well, and is pumped from the well to the distribution system and elevated tank.

Regular determinations at treatment plant, 1951

Determination	Finished water		
	Avg	Max	Min
pH	8.2	8.6	7.0

Prestonsburg, Inland Gas Corp.

Ownership: Inland Gas Corp.
Source: One well, 4 miles southwest of the West Prestonsburg Post Office; Bob Fitzpatrick Branch of Middle Creek, 8350–3735–B, above the pressure station.
Well 8250–3735–8. Depth, 54 ft; diameter, 4 in.; water-bearing strata, Breathitt formation; static water level, 18 to 20 ft below ground; yield, about 10 gpm.
Treatment: Softening in cooling basin, half a mile below the intake on Bob Fitzpatrick Branch.
Storage: Raw water, 8,400 gal in tank on hill (domestic supply); finished water, 120,000 gal in the cooling basin (industrial supply).
Total distribution of water for 1951: 1,800,000 gal.
Breakdown of annual distribution as to use:
Domestic..... 73,000 gal
Industrial..... 1,800,000 gal
Average daily pumpage, 1951: 5,000 gal.
Remarks: Water from the branch is used for cooling about 10½ months each year. Water from the well is used for cooling about 1½ months each year, and for domestic purposes. Water from the branch is piped down to the cooling basin; water from the well is pumped directly into the cooling basin for industrial use, and into the elevated tank for domestic use.

Price, Inland Steel Co., Inc.

Ownership: Inland Steel Co., Inc.
Source: Two wells; Left Fork of Beaver Creek, 8240–3720–A, near State Route 122 at the Price preparation plant.
Well 8240–3720–1, 1,250 ft southeast of the water plant (standby). Depth, 137 ft; diameter, 10 in.; date drilled, March 1949; water-bearing strata, sandstone in the Breathitt formation; static water level, 5 ft 10 in. below ground, March 21, 1949; yield, 100 gpm; specific capacity, 7.58 gpm per foot after 24 hr pumping at average rate of 88.5 gpm.
Well 8240–3720–2, 350 ft southeast of the water plant (standby). Depth, 195 ft; diameter, 10 in.; date drilled, March 1949; water-bearing strata, gritty shale in the Breathitt formation; static water level, 17 ft 4 in. below ground, March 7, 1949; yield, 100 gpm; specific capacity, 1.96 gpm per foot after 24 hr pumping at average rate of 90.6 gpm.
Treatment: Softening; the addition of phosphate (boiler water); prechlorination; the addition of Calgon, alum, and lime; filtration; postchlorination; the addition of more Calgon (domestic water). Water used in the coal-washing plant is not treated.
Storage: Raw water, 500,000 gal in two tanks on a hillside; finished water, 100,000 gal in two tanks on a hillside.
Total distribution of water for 1951: 92,500,000 gal.
Breakdown of annual distribution as to use:
Domestic..... 10,174,000 gal
Industrial..... 82,326,000 gal
Average daily pumpage, when in operation, 1951: 370,000 gal.
Remarks: Most of the water is used for washing coal. Water for the public supply is pumped from the creek to the treatment plant, flows through the plant to the clear well, and is pumped from the well to the distribution system and storage tanks. The water for washing coal is pumped from the creek to the coal-washing plant, flows through the plant, and is pumped to an impounded settling reservoir. No water is recirculated from the reservoir.

Warco

Population served: 16.
Ownership: United Fuels Gas Co.
Source: Two wells (public supply); Right Fork of Beaver Creek, 8245–3732–A, near State Route 80, 1.4 miles north of the Maytown (Langley Post Office), (industrial supply).
Well 8245–3730–3, on a hillside near the cooling tower. Depth, 130 ft; diameter, 6 in.; water-bearing strata, Breathitt formation; date drilled, 1927.
Well 8245–3730–4, at the compressor station. Depth, 90 ft; diameter, 6 in.; water-bearing strata, Breathitt formation; date drilled, 1927.
Treatment: Sedimentation; commercial boiler-water treatment (industrial water).
Storage: Raw water, 45,000 gal in three settling tanks; finished water, 75,000 gal in the pond and one elevated tank.
Total distribution of water for average year: 22,200,000 gal.
From stream..... 21,900,000 gal
From wells..... 292,000 gal
Breakdown of annual distribution as to use:
Domestic..... 292,000 gal
Industrial..... 21,900,000 gal
Average daily pumpage: 60,800 gal.
From stream..... 60,000 gal
From wells..... 800 gal
Remarks: The industrial supply is used mostly for cooling. Water is pumped from the creek to the settling tanks, flows from the tanks to the pond, is pumped from the pond to the cooling tower, and flows from the tower to the distribution system. The water is then recirculated from the distribution system back to the pond. The pumpage figures given represent only makeup water pumped from the creek. No data are available on the amount of water recirculated from the pond.

Watergap, Columbia Fuel Corp.

Ownership: Columbia Fuel Corp.
Source: Two wells (standby); Bull Creek, 8245–3735–A, south of Watergap.
Well 8245–3735–54. Depth, 85 ft; diameter, 6 in.; date drilled, 1939; yield, 3.3 gpm.
Well 8245–3735–55. Depth, 65 ft; diameter, 6 in.; date drilled, 1939.
Treatment: None.

Storage: 315,000 gal in two reservoirs (upper and lower) at plant.
Total distribution of water for 1951: 1,700,000 gal.
Average daily pumpage, 1951: 4,700 gal.
Remarks: The water is used for cooling. Water from the creek is pumped to the upper reservoir, flows through the plant, then flows into the bottom reservoir. Water from the wells is pumped to the lower reservoir, is pumped to the upper reservoir, flows through the plant, then back to the lower reservoir. Well water is used about 2 months per year when the creek fails to supply enough water.

Wayland

Population served: 1,807; Estill and Punkin Center, 193; total, about 2,000.
Ownership: Beaver-Elkhorn Water District.
Source: Two wells (standby); one mine, on State Route 7, 0.3 mile south of the Wayland Post Office.
Well 8245–3725–6. Diameter, 4 in.; water-bearing strata, shale and sandstone in the Breathitt formation; yield, 25 gpm.
Well 8245–3725–7. Diameter, 4 in.; water-bearing strata, shale and sandstone in the Breathitt formation; yield, 40 gpm.
Mine 8245–3725–8. Water-bearing strata, Breathitt formation.
Treatment: Aeration over coke; the addition of lime; filtration; chlorination.
Capacity of treatment plant: 100,000 gpd.
Storage: 100,000 gal in steel tank on hillside.
Total distribution of water August 2, 1952 - April 17, 1953: 33,416,000 gal.
Maximum monthly (December 1952).. 5,310,000 gal
Minimum monthly (February 1953) .. 2,712,000 gal
Average daily pumpage for period of record, 1952–53: 130,000 gal.
Remarks: Water flows from the mine through the treatment plant to the clear well, and is pumped from the well to the distribution system and storage tank. In the fall of 1952, the mine failed to supply enough water and the two standby wells were used. After the standby wells failed, water was pumped to the treatment plant from the Right Fork of Beaver Creek.

Average daily pumpage in gallons, by months, for period of record, 1952–53

August, 1952	124,000	December	171,000
September	130,000	January, 1953	120,000
October	146,000	February	97,000
November	155,000	March	97,000

Analysis, in parts per million, mine 8245–3725–8

(Collected Apr. 17, 1953)

Silica (SiO_2)	11
Iron (Fe)	.26
Manganese (Mn)	.00
Calcium (Ca)	34
Magnesium (Mg)	12
Sodium (Na)	81
Potassium (K)	3.9
Bicarbonate (HCO_3)	80
Sulfate (SO_4)	235
Chloride (Cl)	7.5
Fluoride (F)	0.2
Nitrate (NO_3)	2.4
Dissolved solids	419
Hardness as $CaCO_3$	
Total	135
Noncarbonate	69
Temperature (°F)	54
pH	7.5
Specific conductance at 25°C (micromhos)	657

Weeksbury

Population served: 1,340.
Ownership: Beaver-Elkhorn Water District.
Source: Three wells.
Well 8240–3715–2, on State Route 466, 0.2 mile northeast of the Weeksbury Post Office. Depth, 212 ft; diameter, 8 in.; date drilled, about 1916; water-bearing strata, shale and sandstone in the Breathitt formation; static water level (reported), 70 ft below ground.
Well 8240–3715–3, on State Route 466, 0.1 mile northeast of the Weeksbury Post Office. Depth, 212 ft; diameter, 8 in.; date drilled, about 1916; water-bearing strata, shale and sandstone in the Breathitt formation; static water level (reported), 50 ft below ground.
Well 8240–3715–4, on State Route 466, 1.4 mile southwest of the Weeksbury Post Office. Depth, 212 ft; diameter, 8 in.; date drilled, about 1916; water-bearing strata, shale and sandstone in the Breathitt formation; static water level (reported), 80 ft below ground.
Treatment: Chlorination.
Storage: 450,000 gal in four concrete tanks and one wooden tank.
Total distribution of water for average year: 10,400,000 gal.
Average daily pumpage: 29,000 gal.
Remarks: Water is pumped from well 8240–3715–2 to the wooden storage tank, and is pumped from the storage tank to a concrete tank. Wells 8240–3715–3 and 4 pump water to the concrete storage tanks. The water flows from the concrete storage tanks to the distribution system.

Analysis, in parts per million, well 8240–3715–2

(Collected Apr. 21, 1953)

Silica (SiO_2)	16
Iron (Fe)[1]	.32
Iron (Fe)[2]	7.9
Manganese (Mn)[1]	.00
Manganese (Mn)[2]	.55
Calcium (Ca)	21
Magnesium (Mg)	6.8
Sodium (Na)	.49
Potassium (K)	2.5
Bicarbonate (HCO_3)	172
Sulfate (SO_4)	25
Chloride (Cl)	20
Fluoride (F)	.1
Nitrate (NO_3)	1.0
Dissolved solids	224

[1]In solution when analyzed.
[2]In sediment when analyzed.

Analysis, in parts per million, well 8240–3715–2—Con.

Hardness as $CaCO_3$	
Total	80
Noncarbonate	0
Temperature (°F)	55
pH	8.1
Specific conductance at 25°C (micromhos)	375

Wheelwright

Population served: 2,037; Burton, 160; total, about 2,200.
Ownership: Inland Steel Co., Inc.
Source: One mine, about half a mile south of the Wheelwright Post Office.
Mine 8240–3715–1. Water-bearing strata, Breathitt formation.
Treatment: The addition of alum, lime, Calgon, and sulfuric acid; filtration; chlorination.
Storage: 375,000 gal in five storage tanks.
Total distribution of water for 1951: 136,049,000 gal.
Maximum monthly (August)..... 12,205,500 gal
Minimum monthly (February).. 10,612,100 gal
Average daily pumpage, 1951: 373,000 gal.
Remarks: Water flows from the mine through the treatment plant to the clear well, is pumped from the well to the storage tanks, and flows from the tanks to the distribution system.

Regular determinations at treatment plant, 1951

Determination	Finished water		
	Avg	Max	Min
pH	7.4	8.2	7.0

Analysis, in parts per million, mine 8240–3715–1

(Collected Apr. 22, 1953)

Silica (SiO_2)	8.6
Iron (Fe)	.17
Manganese (Mn)	.00
Calcium (Ca)	45
Magnesium (Mg)	20
Sodium (Na)	129
Potassium (K)	8.2
Carbonate (CO_3)	5
Bicarbonate (HCO_3)	265
Sulfate (SO_4)	235
Chloride (Cl)	14
Fluoride (F)	.4
Nitrate (NO_3)	1.0
Dissolved solids	572
Hardness as $CaCO_3$	
Total	193
Noncarbonate	0
Temperature (°F)	57
pH	7.9
Specific conductance at 25°C (micromhos)	912

GREENUP COUNTY

Greenup

Population served: 1,276; Riverton, 200; total, 1,476.
Ownership: Municipal.
Source: Three wells.
Well 8245–3830–5, in Riverton about 0.75 mile southeast of Greenup. Depth, 60 ft; diameter, 10 in.; water-bearing strata, sand and gravel in alluvium of Quaternary age; static water level, 45 to 50 ft below ground, 1947; yield, 50 gpm.
Well 8245–3830–6, about 40 ft southeast of 8245–3830–5. Depth, 60 ft; diameter, 8 in.; water-bearing strata, sand and gravel in alluvium of Quaternary age; yield, 50 gpm.
Well 8245–3830–7, about 50 ft southwest of repair shop and pump house. Depth, 60 ft; diameter, 20 in.; date drilled, 1949(?); water-bearing strata, sand and gravel in alluvium of Quaternary age; static water level, 37 ft below ground; yield, 65 gpm.
Treatment: Sedimentation when necessary; chlorination.
Storage: 150,000 gal.
Total distribution of water for 1951: 6,712,500 gal.
Maximum monthly (June)..... 738,000 gal
Minimum monthly (February).... 486,600 gal
Average daily pumpage, 1951: 18,000 gal.
Remarks: The water from well 8245–3830–7 is pumped to the distribution system and storage tank. The water from wells 8245–3830–5 and 6 is pumped to a settling tank and pumped from the settling tank to the distribution system and storage tank. Well 8245–3830–7 is pumped almost continuously. Wells 8245–3830–5 and 6 are pumped two or three days a week. The pumpage figures were computed from meter readings and do not include leakage and waste.

Average daily pumpage in gallons, by months, 1951

January	17,000	July	17,000
February	17,000	August	17,000
March	18,000	September	17,000
April	19,000	October	18,000
May	19,000	November	18,000
June	25,000	December	18,000

Analysis, in parts per million, well 8245–3830–5

(Collected Aug. 5, 1952)

Silica (SiO_2)	17
Iron (Fe)	.37
Manganese (Mn)	.00
Calcium (Ca)	46
Magnesium (Mg)	13
Sodium (Na)	10
Potassium (K)	1.1
Bicarbonate (HCO_3)	132
Sulfate (SO_4)	59
Chloride (Cl)	15
Fluoride (F)	.0
Nitrate (NO_3)	5.3

Analysis, in parts per million, well 8245–3830–5—Con.

Dissolved solids	237
Hardness as $CaCO_3$	
Total	169
Noncarbonate	60
Temperature (° F)	53
pH	6.8
Specific conductance at 25° C (micromhos)	392

Load

Population served: 70.
Ownership: Tennessee Gas & Transmission Co.
Source: Impounding reservoir, 8255–3830–A, near State Route 7 at Load.
Treatment: Softening with zeolites; the addition of lime and ferrous sulfate; chlorination (domestic supply); the addition of caustic soda and chromate (industrial supply).
Capacity of treatment plant: 100,000 gpd.
Storage: Raw water, 15,000,000 gal in impounding reservoir; finished water, 160,000 gal of softened water in one steel tank, 6,200 gal of treated water for domestic use in a steel tank.
Total distribution of water for average year: 8,400,000 gal.
Average daily pumpage: 23,000 gal.
Remarks: Most of the water is used for cooling. The water is pumped from the lake through the softener, is pumped from the softener to a storage tank, flows from the tank to a makeup tank where the water is treated for industrial use, or flows to a domestic makeup tank and is pumped from the domestic makeup tank to the distribution system and domestic storage tank.

Riverton

Population served: 125.
Ownership: King Powder Co.
Source: One well, near U. S. 23, about 1 mile southeast of Riverton.
Well 8245–3830–4. Depth, 68 ft; diameter, 8 in.; date drilled, 1952; water-bearing strata, sand and gravel in alluvium of Quaternary age; yield, 38 gpm.
Treatment: Chlorination.
Storage: 40,000 gal in concrete storage tank on hillside southwest of the well.
Total distribution of water for average year: 6,240,000 gal.
Average daily pumpage: 20,000 gal.
Remarks: Water is pumped from the well to the storage tank and flows from the tank to the distribution system.

Analysis, in parts per million, well 8245–3830–4

(Collected Dec. 3, 1952)

Silica (SiO_2)	17
Iron (Fe)	1.3
Manganese (Mn)	.50
Calcium (Ca)	17
Magnesium (Mg)	7.3
Sodium (Na)	16
Potassium (K)	1.9
Bicarbonate (HCO_3)	40
Sulfate (SO_4)	42
Chloride (Cl)	8.5
Fluoride (F)	.1
Nitrate (NO_3)	29
Dissolved solids	151
Hardness as $CaCO_3$	
Total	72
Noncarbonate	40
Temperature (° F)	56
pH	6.4
Specific conductance at 25° C (micromhos)	252

Russell, Chesapeake & Ohio Railway Co.

Ownership: Chesapeake & Ohio Railway Co.
Source: Two wells, near U. S. 23, 1.1 miles east of Raceland; Ohio River, 8240–3830–A, about 0.2 mile west of Russell.
Well 8240–3830–1. Depth, 74.5 ft; date drilled, 1948; water-bearing strata, sand and gravel in alluvium of Quaternary age; yield, 100 gpm.
Well 8240–3830–2. Depth, 74.5 ft; date drilled, 1948(?); water-bearing strata, sand and gravel in alluvium of Quaternary age.
Treatment: The addition of soda ash, lime, cuprous nitrate, aluminate; commercial boiler-water treatment (surface water).
Storage: 2,356,000 gal in six standpipes and storage tanks at Russell yards and two elevated tanks 1.1 miles east of Raceland.
Total distribution of water for 1950: 703,920,000 gal.
From river 675,416,000 gal
Maximum monthly (April) 64,368,000 gal
Minimum monthly (February) 36,965,000 gal
From wells 28,500,000 gal
Average daily pumpage, 1950: 1,929,000 gal.
From river 1,851,000 gal
From wells 78,000 gal
Remarks: The well water is used for industrial and domestic purposes at the car shop near Raceland. Most of the water from the Ohio River is for generating steam in locomotives. The water is pumped from the wells to the elevated storage tanks and flows from the tanks to the distribution system. The wells are pumped alternately for 30 days each. The water is pumped from the Ohio River through the treatment plant to the storage tanks and flows from the tanks to distribution points.

Average daily pumpage in gallons, by months, from the Ohio River, 1950

January	1,620,000	July	1,740,000
February	1,320,000	August	1,970,000
March	1,980,000	September	2,060,000
April	2,145,000	October	2,010,000
May	1,800,000	November	1,930,000
June	1,809,000	December	1,790,000

South Shore

Population served: 1,575 in South Shore and Fullerton.
Ownership: South Shore Supply Co. (W. B. Hannah, owner, Portsmouth, Ohio).

Source: Three wells.
Well 8255–3840–1, in treatment plant on Main Street near old ferry landing. Depth, 80 ft; diameter, 12 in.; water-bearing strata, sand and gravel in alluvium of Quaternary age; static water level, 45 ft below ground when drilled.
Well 8255–3840–2, 35 ft west of 8255–3840–1. Depth, 80 ft; diameter, 12 in.; water-bearing strata, sand and gravel in alluvium of Quaternary age.
Well 8255–3840–3, about 35 ft west of 8255–3840–2. Depth, 80 ft; diameter, 12 in.; water-bearing strata, sand and gravel in alluvium of Quaternary age.
Treatment: Chlorination.
Storage: 100,000 gal.
Total distribution of water for 1951: 25,340,000 gal.
Breakdown of annual distribution as to use:
Domestic..... 28,740,000 gal
Industrial..... 6,600,000 gal
Average daily pumpage, 1951: 97,000 gal.
Remarks: Water is pumped from the wells through the treatment plant to the distribution system and storage tanks. The wells are usually pumped alternately for 24 hr each, except in hot weather when both wells are pumped.

Average daily pumpage in gallons, by months, 1951
(Industrial water supply only)

January	16,000	July	30,000
February	20,000	August	27,000
March	18,000	September	23,000
April	17,000	October	8,000
May	22,000	November	6,000
June	26,000	December	4,000

Analysis, in parts per million, well 8255–3840–1

(Collected July 28, 1952)

Silica (SiO_2)	23
Iron (Fe)	.13
Manganese (Mn)	.13
Calcium (Ca)	67
Magnesium (Mg)	16
Sodium (Na)	15
Potassium (K)	1.2
Bicarbonate (HCO_3)	205
Sulfate (SO_4)	58
Chloride (Cl)	16
Fluoride (F)	.2
Nitrate (NO_3)	22
Dissolved solids	313
Hardness as $CaCO_3$	
Total	234
Noncarbonate	65
Temperature (°F)	57
pH	7.3
Specific conductance at 25°C (micromhos)	513

Wurtland, E. I. duPont de Nemours & Co.

Ownership: E. I. duPont de Nemours & Co.
Source: Two wells; Ohio River, 8245–3830–A, 0.1 mile west of Wurtland.
Well 8245–3830–1, near river intake at plant. Depth, 67 ft; diameter, 24 in.; date drilled, 1926; water-bearing strata, sand and gravel in alluvium of Quaternary age; static water level, 40 ft below ground when drilled; yield, 330 gpm maximum when drilled.
Well 8245–3830–2, about 220 ft east of river intake at plant. Depth, 81 ft; diameter, 12 in.; date drilled, 1950; water-bearing strata, sand and gravel in alluvium of Quaternary age; static water level, 40.23 ft below ground, July 11, 1950; yield, 150 gpm; specific capacity, 10.5 gpm per foot after $6\frac{1}{2}$ hr pumping at an average rate of 150 gpm.
Treatment: The addition of soda ash; commercial boiler-water treatment (boiler water).
Storage: Raw water, 100,000 gal in elevated steel tank.
Total distribution of water for average year: 123,000,000 gal.
From river..... 120,000,000 gal
From wells..... 3,000,000 gal
Average daily pumpage: 492,000 gal.
From river..... 480,000 gal
From wells..... 12,000 gal
Remarks: The well water is used for steam generation in the manufacture of sulfuric acid. The river water is used for cooling. The well water is pumped to the storage tank and flows from the tank to the boiler and the acid vats. The river water is pumped from the river through the cooling system and flows back to the river.

Analysis, in parts per million, well 8245–3830–2

(Collected Sept. 10, 1952)

Silica (SiO_2)	16
Iron (Fe)	.10
Manganese (Mn)	.04
Calcium (Ca)	47
Magnesium (Mg)	21
Sodium (Na)	11
Potassium (K)	3.3
Bicarbonate (HCO_3)	43
Sulfate (SO_4)	174
Chloride (Cl)	7.5
Fluoride (F)	.0
Nitrate (NO_3)	9.0
Dissolved solids	323
Hardness as $CaCO_3$	
Total	206
Noncarbonate	168
Temperature (°F)	57
pH	7.2
Specific conductance at 25°C (micromhos)	478

HARLAN COUNTY

Alva

Population served: 1,500.
Ownership: Black Star Coal Corp.
Source: Two wells (public supply); Lees Fork of Rockhouse Branch, 8320–3640–A (industrial supply).
Well 8320–3640–3, 0.3 mile southeast of the Alva Post Office. Depth, 260 ft; diameter, 6 in.; water-bearing strata, sandstone in undifferentiated post-Lee rocks of Pennsylvanian age; yield, 50+ gpm.
Well 8325–3640–1, 0.6 mile northwest of the Alva

Post Office. Depth, 250 ft; diameter, 5 in.; date drilled, 1949; water-bearing strata, undifferentiated post-Lee rocks of Pennsylvanian age.
Treatment: Chlorination (well water).
Storage: Raw water, 50,000 gal in covered concrete reservoir; finished water, 30,000 gal in wooden tank on hillside.
Total distribution of water for average year: 93,625,000 gal.
From stream.....48,000,000 gal
From wells..... 45,625,000 gal
Breakdown of annual distribution as to use:
Domestic..... 45,625,000 gal
Industrial..... 48,000,000 gal
Average daily pumpage: 317,000 gal.
From stream..... 192,000 gal
From wells.....125,000 gal
Remarks: The water from the two wells is used for the public supply and the water from Lees Fork is used for washing coal. The water from well 8320–3640–3 is pumped by airlift from the well to the raw water storage reservoir, is pumped from the reservoir to the finished-water storage tank 200 ft above the well, and flows from the tank to the distribution system. The water from well 8325–3640–1 is pumped from the well to a pressure tank and flows from the tank to the distribution system. The water from Lees Fork is diverted into an abandoned section of a coal mine 47 ft below drainage through two 8-inch holes drilled in the creek bed; the water flows from a drift opening of the coal mine, which is above drainage, through the coal-washing plant, is pumped from the coal-washing plant into another abandoned section of the coal mine for settlement and is stored there for recirculation when needed. There is probably a mixture of surface water from Lees Fork and ground water stored in the coal mine, but most of the water used is believed to be water diverted to the coal mine from Lees Fork.

Analysis, in parts per million, well 8320–3640–3

(Collected Mar. 26, 1953)

Silica (SiO_2)	18
Iron (Fe)	.40
Manganese (Mn)	.00
Calcium (Ca)	26
Magnesium (Mg)	7.0
Sodium (Na)	88
Potassium (K)	1.7
Carbonate (CO_3)	10
Bicarbonate (HCO_3)	236
Sulfate (SO_4)	57
Chloride (Cl)	12
Fluoride (F)	.2
Nitrate (NO_3)	.8
Dissolved solids	324
Hardness as $CaCO_3$	
Total	93
Noncarbonate	0
Temperature (°F)	58
pH	8.0
Specific conductance at 25°C (micromhos)	541

Analysis, in parts per million, well 8325–3640–1

(Collected Mar. 26, 1953)

Silica (SiO_2)	20
Iron (Fe)	.08
Manganese (Mn)	.00
Calcium (Ca)	26
Magnesium (Mg)	10
Sodium (Na)	44
Potassium (K)	1.3
Bicarbonate (HCO_3)	162
Sulfate (SO_4)	56
Chloride (Cl)	10
Fluoride (F)	.1
Nitrate (NO_3)	.8
Dissolved solids	237
Hardness as $CaCO_3$	
Total	108
Noncarbonate	0
Temperature (°F)	59
pH	7.8
Specific conductance at 25°C (micromhos)	398

Bardo

Population served: 150.
Ownership: Bardo Coal Mining Co., Inc.
Source: One well, near State Route 72, about 75 ft east of the Bardo Post Office.
Well 8320–3645–1. Depth, about 180 ft.
Treatment: None.
Storage: 500 gal.
Total distribution of water for average year: 821,000 gal.
Average daily pumpage: 2,000 gal.

Benham

Population served: 3,000.
Ownership: International Harvester Co.
Source: One drainage tunnel; one coal mine; Maggard Branch impounded near No. 1 Mine; Scott Branch impounded south of Benham.
Drainage tunnel 8255–3655–1 (standby), 1,300 ft southeast of the Benham Post Office. Water-bearing strata, sandstone and shale in undifferentiated post-Lee rocks of Pennsylvanian age.
Mine 8255–3655–2 (standby), Machine Shop Hollow. Water-bearing strata, coal in undifferentiated post-Lee rocks of Pennsylvanian age.
Treatment: Aeration; coagulation; sedimentation; filtration; chlorination. The treatment plant is located west of No. 1 Mine tipple, near the bathhouses.
Capacity of treatment plant: 480,000 gpd.
Storage: Raw water, 2,000,000 gal in No. 1 Mine, 84,000 gal in Maggard Branch impounded, and 300,000 gal in Scott Branch impounded; finished water, 580,000 gal in clear well and two tanks on hills.
Total distribution of water for 1950: 52,700,000 gal.
From stream..... 43,900,000 gal
From mine..... 8,800,000 gal

Breakdown of annual distribution as to use (approximate):
- Domestic..... 42,200,000 gal
- Industrial and commercial..... 10,500,000 gal

Average daily pumpage, 1950: 144,000 gal.
- From stream, when in use (approximate)..... 146,000 gal
- From mine, when in use (approximate)..... 138,000 gal

Remarks: The water flows from Maggard Branch impounded and No. 1 Mine into the plant by gravity. Water from the drainage tunnel is pumped into the main line leading to the plant, then flows by gravity into the plant. All water flows through the plant, is pumped into the reservoir tanks, then flows through the distribution system by gravity. Surface water is used about 9 months of the year, ground water about 3 months of the year.

Regular determinations at treatment plant, 1950

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	92	270	32	95	244	40
pH	7.5	7.7	7.1	7.6	7.8	7.5
Turbidity	29	800	20	0	0	0

Average daily pumpage in gallons, by months, 1950

January	157,000	July	142,000
February	151,000	August	137,000
March	153,000	September	141,000
April	151,000	October	137,000
May	149,000	November	138,000
June	144,000	December	135,000

Analysis, in parts per million, Maggard Branch, finished water

(Collected May 9, 1951)

Silica (SiO_2)	4.1
Iron (Fe)	.17
Manganese (Mn)	.00
Calcium (Ca)	15
Magnesium (Mg)	5.3
Sodium (Na)	19
Potassium (K)	1.6
Bicarbonate (HCO_3)	76
Sulfate (SO_4)	31
Chloride (Cl)	5.0
Fluoride (F)	.1
Nitrate (NO_3)	.9
Dissolved solids	113
Hardness as $CaCO_3$	
Total	60
Noncarbonate	0
pH	7.8
Specific conductance at 25° C (micromhos)	205

Analysis, in parts per million, drainage tunnel 8255–3655–1

(Collected Aug. 6, 1953)

Silica (SiO_2)	8.1
Iron (Fe)	.40
Manganese (Mn)	.00
Calcium (Ca)	51
Magnesium (Mg)	22
Sodium (Na)	156
Potassium (K)	4.6
Carbonate (CO_3)	25
Bicarbonate (HCO_3)	515
Sulfate (SO_4)	82
Chloride (Cl)	8.5
Fluoride (F)	.1
Nitrate (NO_3)	1.3
Dissolved solids	612
Hardness as $CaCO_3$	
Total	218
Noncarbonate	0
Temperature (° F)	57
pH	8.3
Specific conductance at 25° C (micromhos)	984

Analysis, in parts per million, mine 8255–3655–2

(Collected May 9, 1951)

Silica (SiO_2)	5.6
Iron (Fe)	.26
Manganese (Mn)	.00
Calcium (Ca)	43
Magnesium (Mg)	22
Sodium (Na)	60
Potassium (K)	3.9
Bicarbonate (HCO_3)	284
Sulfate (SO_4)	88
Chloride (Cl)	2.0
Fluoride (F)	.1
Nitrate (NO_3)	2.4
Dissolved solids	356
Hardness as $CaCO_3$	
Total	198
Noncarbonate	0
pH	6.9
Specific conductance at 25° C (micromhos)	605

Brookside

Population served: 400.

Ownership: Harlan Collieries Co.

Source: Three wells.

Well 8315–3650–4. 100 ft northeast of the Brookside Post Office. Depth, 211 ft; diameter, 6 in.; water-bearing strata, undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 25 ft below ground; yield, 120 gpm.

Well 8315–3650–5, 0.1 mile west of the Brookside Post Office. Depth, 222 ft; diameter, 6 in.; water-bearing strata, undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 22 ft below ground; yield, 80 gpm.

Well 8315–3650–6, near State Route 38, 0.3 mile southwest of the Brookside Post Office. Depth, 135 ft; water-bearing strata, undifferentiated post-Lee rocks of Pennsylvanian age.

Treatment: None.

Storage: Raw water, 42,000 gal in tank on hillside northeast of the Brookside Post Office.

Total distribution of water for average year: 10,290,000 gal.

Average daily pumpage, when preparation plant in operation: 38,000 gal.

Remarks: Most of the water is used for washing coal. The water from wells 8315–3650–4 and 5 is pumped to the storage tank and flows from the tank through the system. Pumping is regulated by a float gage in the storage tank.

Analysis, in parts per million, wells 8315–3650–4 and 5, composite sample

(Collected Mar. 10, 1953)

Silica (SiO_2)	16
Iron (Fe)	.43
Manganese (Mn)	.00
Calcium (Ca)	14
Magnesium (Mg)	3.2
Sodium (Na)	62
Potassium (K)	1.0
Bicarbonate (HCO_3)	196
Sulfate (SO_4)	5.7
Chloride (Cl)	12
Fluoride (F)	.3
Nitrate (NO_3)	.1
Dissolved solids	213
Hardness as $CaCO_3$	
Total	47
Noncarbonate	0
Temperature (°F)	58
pH	7.3
Specific conductance at 25°C (micromhos)	335

Chevrolet

Population served: 472.

Ownership: Blue Diamond Coal Co.

Source: Five wells with electric pumps, six wells with hand pumps. Mine water for dust control at coal preparation plant.

Wells 8315–3645–15 through 8315–3645–25. Depth, 65 to 263 ft.

Treatment: None.

Storage: 12,000 gal, for well 8315–3645–20.

Total distribution of water for average year: 2,311,300 gal.

Breakdown of annual distribution as to use:

Domestic	2,051,000 gal
Industrial	260,000 gal

Average daily pumpage: 7,000 gal.

Closplint

Population served: 440.

Ownership: Closplint School Boosters Club.

Source: Clover Fork of the Cumberland River, near State Route 38, 0.2 mile northwest of the Closplint Post Office.

Treatment: Coagulation with alum and lime; filtration; chlorination.

Capacity of treatment plant: 160,000 gpd.

Storage: 210,000 gal in clear well and steel storage tank on hillside north of the Closplint Post Office.

Total distribution of water for average year: 23,725,000 gal.

Average daily pumpage: 65,000 gal.

Remarks: Water is pumped from the river to the treatment plant, flows through the plant to the clear well, is pumped from the well to the storage tank, and flows from the tank to the distribution system.

Coalgood

Population served: 800.

Ownership: Mary Helen Coal Co.

Source: Four wells; one mile, north of Coalgood.

Well 8310–3645–1, 0.6 mile northeast of the Coalgood Post Office (supplies 6 or 7 people). Depth, 130 ft; diameter, 6 in.

Mine 8310–3645–2. Water-bearing strata, undifferentiated post-Lee rocks of Pennsylvanian age.

Well 8315–3645–1, 0.2 mile southwest of the Coalgood Post Office. Depth, 207 ft; diameter, 6 in.; date drilled, 1949; water-bearing strata, undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 60 ft below ground; yield, 75 gpm.

Well 8315–3645–3, 0.1 mile east of the Coalgood Post Office (standby). Depth, 130 ft; diameter, 6 in.

Well 8315–3645–4, 0.1 mile east of the Coalgood Post Office (standby). Depth, 139 ft; diameter, 6 in.

Treatment: Chlorination.

Storage: 10,000 gal in tank on hillside north of the Coalgood Post Office.

Total distribution of water for average year: 10,800,000 gal.

Breakdown of annual distribution as to use:

Domestic	9,050,000 gal
Industrial	1,750,000 gal

Average daily pumpage: 30,000 gal.

Remarks: Water from well 8315–3645–1 is pumped to the 10,000-gal storage tank and flows from the tank through the system. Water from well 8310–3645–1 is pumped to a small pressure tank and flows to five houses. Water from coal mine 8310–3645–2 flows to the bathhouse.

Analysis, in parts per million, well 8315–3645–1

(Collected Mar. 17, 1953)

Silica (SiO_2)	12
Iron (Fe)	.26
Manganese (Mn)	.00
Calcium (Ca)	26
Magnesium (Mg)	8.5
Sodium (Na)	50
Potassium (K)	2.1
Bicarbonate (HCO_3)	163
Sulfate (SO_4)	51
Chloride (Cl)	20
Fluoride (F)	.1
Nitrate (NO_3)	1.5
Dissolved solids	255

Analysis, in parts per million, well 8315–3645–1—Con.

Hardness as $CaCO_3$	
Total	101
Noncarbonate	0
Temperature (°F)	59
pH	6.9
Specific conductance at 25°C (micromhos)	408

Coxton

Population served: 648.
Ownership: Blue Diamond Coal Co.
Source: One well.
Well 8315–3650–8. Depth, 384 ft; diameter, 6 in.
Treatment: None.
Storage: 64,000 gal.

Crummies

Population served: 360.
Ownership: Crummies Creek Coal Co., Inc.
Source: Six wells with electric pumps, four wells with hand pumps.
Treatment: None.

Cumberland

Population served: 4,650.
Ownership: Municipal.
Source: Poor Fork of the Cumberland River near U. S. Highway 119 in northeast Cumberland.
Treatment: Coagulation with alum and lime; prechlorination (spring, summer, and fall seasons); filtration through anthrofelt; rapid sand filtration; treatment with activated carbon; postchlorination.
Capacity of treatment plant: 864,000 gpd.
Storage: 57,000 gal in a settling tank, 102,000 gal in the clear well and a steel tank on a hillside south of Cumberland. Storage capacity will be increased when construction of a new 75,000 gal clear well and a 300,000 gal steel tank is completed.
Total distribution of water for 1951: 74,659,000 gal.
Maximum monthly (August)..... 6,933,000 gal
Minimum monthly (April)..... 5,589,000 gal
Average daily pumpage, 1951: 205,000 gal.
Remarks: Water is pumped from the river to the treatment plant, flows through the treatment plant to the clear well, and is pumped from the clear well to the distribution system and storage tank.

Regular determinations at treatment plant, 1951

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	[1]28	75	18	[1]64	87	36
pH[2]	7.2	8.0	6.5	7.6	8.4	6.8
Turbidity	[3]90	2,000	0	[3]5	65	0

[1]December and November.
[2]11-month record.
[3]December only.

Average daily pumpage in gallons, by months, 1951

January	195,000	July	212,000
February	202,000	August	224,000
March	191,000	September	219,000
April	186,000	October	216,000
May	189,000	November	217,000
June	191,000	December	218,000

Cumberland, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: Poor Fork of the Cumberland River, 8255–3655–A, in Cumberland.
Treatment: Commercial boiler-water treatment.
Storage: 63,000 gal at the railroad depot in Cumberland.
Total distribution of water for average year: 438,000 gal.
Average daily pumpage: 12,000 gal.
Remarks: The water is used for generating steam in locomotives.

Draper Camp (Post Office Evarts)

Population served: 250.
Ownership: Harcrow Coal Co., Inc.
Source: One well.
Well 8310–3650–2. Depth, 100 ft.
Treatment: None.

Elcomb (Post Office Teetersville)

Population served: 225.
Ownership: Elcomb Coal Co.
Source: Three wells with hand pumps, two wells with electric pumps.
Well 8325–3645–2, 0.6 mile northeast of the Teetersville Post Office. Depth, 125 ft; diameter, 6 in.; date drilled, 1948; water-bearing strata, sandstone in undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 15 ft below ground; yield, 3 gpm.
Treatment: None.

Evarts

Population served: 2,060.
Ownership: Municipal.
Source: Clover Fork of the Cumberland River, near State Route 38, 0.2 mile east of the Evarts Post Office.
Treatment: Coagulation with alum and lime; filtration; chlorination.
Storage: 160,000 gal in the clear well and a concrete storage tank on a hillside southwest of Evarts.
Total distribution of water for average year: 13,140,000 gal.
Average daily pumpage: 36,000 gal.
Remarks: Water flows from the river to a raw-water collector, is pumped from the collector to the treatment plant, flows through the plant to the clear well, and is pumped from the well to the distribution system and storage reservoir.

Evarts, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: Clover Fork of the Cumberland River, 8310–3650–A, 0.5 mile northeast of the railroad depot at Evarts.
Treatment: Commercial boiler-water treatment.
Storage: 113,000 gal in two wooden storage tanks.
Total distribution of water for average year: 4,380,000 gal.
Average daily pumpage: 12,000 gal.
Remarks: The water is used for generating steam in locomotives.

Grays Knob

Population served: 320; high school and vocational school, 300; total, 620.
Ownership: Mr. W. J. Simonton.
Source: Two wells.
Well 8315–3645–13, 0.4 mile south of the Grays Knob Post Office. Depth, 200 ft; diameter, 6 in.; water-bearing strata, undifferentiated post-Lee rocks of Pennsylvanian age.
Well 8315–3645–14 (standby), 450 ft west of 8315–3645–13. Depth, 100 ft; water-bearing strata, undifferentiated post-Lee rocks of Pennsylvanian age.
Treatment: Chlorination.
Storage: 10,000 gal in tank on a hillside south of Grays Knob.
Total distribution of water, March 1952 - February 1953: 3,930,000 gal.
Average daily pumpage: 11,000 gal.
Remarks: Water from well 8315–3645–13 is pumped through the system into the storage tank.

Average daily pumpage in gallons, by months, 1952–53

(Water supplied to high school only.)

March 1952	5,000	September	2,000
April	3,000	October	5,000
May	2,000	November	3,000
June	300	December	5,000
July	—	January 1953	6,000
August	2,000	February	9,000

Analysis, in parts per million, well 8315–3645–13

(Collected Mar. 18, 1953)

Silica (SiO_2)	19
Iron (Fe)	2.2
Manganese (Mn)	.00
Calcium (Ca)	16
Magnesium (Mg)	5.6
Sodium (Na)	38
Potassium (K)	1.1
Bicarbonate (HCO_3)	160
Sulfate (SO_4)	4.3
Chloride (Cl)	7.0
Fluoride (F)	.1
Nitrate (NO_3)	.8
Dissolved solids	169
Hardness as $CaCO_3$	
Total	62
Noncarbonate	0
Temperature (°F)	57
pH	6.9
Specific conductance at 25°C (micromhos)	265

Harlan

Population served: 5,380; Baxter, 875; Loyall, 1,925; total, 8,180.
Ownership: Municipal.
Source: Poor Fork of the Cumberland River, at Baxter.
Treatment: Ammoniation; prechlorination; coagulation with alum and lime; the addition of carbon; sedimentation; filtration; postchlorination.
Capacity of treatment plant: 1,000,000 gpd.
Storage: Finished water, 500,000 gal in two concrete reservoirs on hills, and 60,000 gal in clear well.
Total distribution of water for 1950: 151,378,000 gal.
Breakdown of annual distribution as to use (estimated):
Domestic 90,000,000 gal
Industrial and commercial 38,000,000 gal
Other public uses 8,000,000 gal
Leakage and waste 15,000,000 gal
Average daily pumpage, 1950: 415,000 gal.
Remarks: Water is pumped from the river, flows through the treatment plant, is pumped to reservoirs on hills, and flows by gravity to the distribution system.

Regular determinations at treatment plant, 1950

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	84	206	8	100	210	28
pH	7.9	8.4	6.8	8.4	8.4	8.0

Average daily pumpage in gallons, by months, 1950

January	376,000	July	505,000
February	366,000	August	457,000
March	331,000	September	415,000
April	410,000	October	431,000
May	404,000	November	405,000
June	471,000	December	411,000

Harlan, Chappell's Dairy

Ownership: Chappell's Dairy.
Source: One well, at the dairy.
Well 8315–3650–1. Depth, 500 ft (reported); diameter, 8 in.; date drilled, about 1945; water-bearing strata, "soapstone" in undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 300 ft (reported) below ground; yield, 25 gpm.
Treatment: None.
Storage: 20,000 gal in a tank on a hillside by well.
Total distribution of water for 1950: 13,140,000 gal.
Average daily pumpage, 1950: 36,000 gal.
Remarks: Water is pumped from the well to the storage tank and flows to the dairy by gravity.

Analysis, in parts per million, well 8315–3650–1

(Collected Dec. 8, 1953)

Silica (SiO_2)	17
Iron (Fe)	.53
Manganese (Mn)	.00
Calcium (Ca)	3.4
Magnesium (Mg)	1.4
Sodium (Na)	137
Potassium (K)	1.0
Bicarbonate (HCO_3)	314
Sulfate (SO_4)	6.3
Chloride (Cl)	34
Fluoride (F)	.4
Nitrate (NO_3)	1.8
Dissolved solids	350
Hardness as $CaCO_3$	
Total	14
Noncarbonate	0
Temperature (° F)	57
pH	7.5
Specific conductance at 25° C (micromhos)	581

Highsplint

Population served: 740.
Ownership: Highsplint Coal Co.
Source: One well with electric pump, six wells with hand pumps.
Well 8305–3650–7. Depth, 183 ft.
Treatment: None.
Storage: 2,000 gal.

Insull

Ownership: Southern Mining Co.
Source: Three wells with electric pumps, several wells with hand pumps.
Treatment: Chlorination.

Kenvir

Population served: 3,500.
Ownership: Peabody Coal Co. (formerly Black Mountain Corp.).
Source: Five wells; Yocum Creek, 8305–3650–A, 1.5 miles southeast of the Kenvir Post Office.
Well 8305–3650–1, on Yocum Creek, 0.7 mile east of Dizney Post Office (industrial standby). Depth, 262 ft; diameter, 10 in.; date drilled, August 28, 1951; water-bearing strata, undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 56.25 ft below ground when drilled; yield, 85 gpm.
Well 8305–3650–2, 1.5 miles southeast of the Kenvir Post Office (industrial standby). Depth, 78 ft; diameter, 12 in.; date drilled, July 2, 1952; water-bearing strata, sandstone in undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 31 ft below ground, July 6, 1952; yield, 20+ gpm.
Well 8305–3650–3, 1.5 miles southeast of the Kenvir Post Office (industrial supply). Depth, 250 ft; diameter, 6 in.; date drilled, September 1, 1926; water-bearing strata, undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 37 ft below ground.
Well 8305–3650–4, 1 mile southeast of the Kenvir Post Office (public supply). Depth, 266 ft; diameter, 16 to 12 in.; date drilled, August 26, 1942; water-bearing strata, sandstone in undifferentiated post-Lee rocks of Pennsylvanian age; static water level, about 50 ft below ground.
Well 8305–3650–5, 0.1 mile southeast of the Kenvir Post Office (public supply). Depth, 229 ft; diameter, 8 in.; date drilled, August 18, 1918; water-bearing strata, undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 57 ft (normal) to 65 ft (dry weather) below ground.
Treatment: Chlorination (public supply).
Storage: Raw water, 35,800 gal in three wooden tanks; finished water, 10,500 gal in one wooden tank.
Total distribution of water for average year: 388,950,000 gal.
From stream..... 361,200,000 gal
From wells..... 27,750,000 gal
Breakdown of annual distribution as to use:
Domestic..... 20,250,000 gal
Industrial..... 367,700,000 gal
Average daily pumpage, when in operation: 2,900,000 gal.
From stream..... 2,806,000 gal
From wells..... 94,000 gal
Remarks: Water for the public supply is pumped from the wells to the storage tanks, and flows from the tanks to the distribution system. Water from Yocum Creek and well 8305–3650–3 is used for washing coal. Water from well 8305–3650–3, used in the bathhouse, is pumped from the well to a storage tank on a hillside and flows from the tank to the washing plant and bathhouse. Makeup water from Yocum Creek is pumped from the creek to the cone, and flows from the cone through the washing plant to a sump; 2,700 gpm is recirculated from the sump to the cone and washer. The average daily surface-water pumpage, 2,806,000 gal, includes both the makeup water pumped from the creek and the water recirculated from the sump.

Analysis, in parts per million, well 8305–3650–4

(Collected Mar. 12, 1953)

Silica (SiO_2)	12
Iron (Fe)	.84
Manganese (Mn)	.00
Calcium (Ca)	20
Magnesium (Mg)	5.3
Sodium (Na)	30
Potassium (K)	1.8
Bicarbonate (HCO_3)	131
Sulfate (SO_4)	13
Chloride (Cl)	12
Fluoride (F)	.1
Nitrate (NO_3)	.1
Dissolved solids	158
Hardness as $CaCO_3$	
Total	72
Noncarbonate	0
Temperature (° F)	57
pH	7.1
Specific conductance at 25° C (micromhos)	262

Analysis, in parts per million, well 8305–3640–5

(Collected Mar. 12, 1953)

Silica (SiO_2)	13
Iron (Fe)	.67
Manganese (Mn)	.00
Calcium (Ca)	36
Magnesium (Mg)	11
Sodium (Na)	29
Potassium (K)	1.7
Bicarbonate (HCO_3)	142
Sulfate (SO_4)	59
Chloride (Cl)	12
Fluoride (F)	.1
Nitrate (NO_3)	.4
Dissolved solids	227
Hardness as $CaCO_3$	
Total	136
Noncarbonate	19
Temperature (° F)	56
pH	7.4
Specific conductance at 25° C (micromhos)	360

Kitts

Population served: 600.
Ownership: Clover Fork Coal Co.
Source: One mine, southeast of Kitts.
Mine 8315–3650–3. Water-bearing strata, coal in undifferentiated post-Lee rocks of Pennsylvanian age.
Treatment: Chlorination.
Total distribution of water, June 1, 1952 - January 2, 1953: 59,659,000 gal.
Average daily pumpage: 276,000(?) gal.
Remarks: Water from the mine flows through the chlorinator to the distribution system. The per capita water consumption is high, possibly because the water is supplied free.

Analysis, in parts per million, mine 8315–3650–3

(Collected Mar. 10, 1953)

Silica (SiO_2)	5.5
Iron (Fe)	.09
Manganese (Mn)	.00
Calcium (Ca)	13
Magnesium (Mg)	6.3
Sodium (Na)	130
Potassium (K)	2.8
Bicarbonate (HCO_3)	199
Sulfate (SO_4)	170
Chloride (Cl)	3.0
Fluoride (F)	.2
Nitrate (NO_3)	4.2
Dissolved solids	441
Hardness as $CaCO_3$	
Total	59
Noncarbonate	0
Temperature (° F)	54
pH	7.2
Specific conductance at 25° C (micromhos)	667

Lenarue

Population served: 120
Ownership: Imperial Harlan Coal Co.
Source: Two wells with electric pumps; four wells with hand pumps.
Well 8315–3645–5, 0.2 mile northeast of the Lenarue Post Office. Depth, 387 ft; diameter, 6 in.; water-bearing strata, sandstone in undifferentiated post-Lee rocks of Pennsylvanian age.
Well 8315–3645–6, at bathhouse, 0.2 mile northeast of the Lenarue Post Office. Depth, 107 ft; diameter, 6 in.
Treatment: None.
Storage: 2,000 gal.

Liggett

Population served: 400.
Ownership: Perkins-Harlan Coal Co., Inc.
Source: One well, at the Liggett Post Office; one mine, 0.3 mile south of the Liggett Post Office.
Mine 8320–3640–2. Water-bearing strata, coal (Harlan seam) in undifferentiated post-Lee rocks of Pennsylvanian age.
Well 8320–3645–5. Depth, 408 ft; diameter, 10 to 8 in.; date drilled, March 1948; water-bearing strata, sandstone in undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 140 ft below ground when drilled.
Treatment: None.
Storage: 12,000 gal.

Louellen

Population served: 1,500.
Ownership: Cornett-Lewis Coal Co., Inc.
Source: One mine at Louellen.
Mine 8305–3650–6. Water-bearing strata, coal (Harlan seam) in undifferentiated post-Lee rocks of Pennsylvanian age.
Treatment: Chlorination.
Storage: 18,000 gal.

Loyall, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: Cumberland River, 8320–3650–A, 0.3 mile northwest of the junction of State Routes 413 and 119.
Treatment: Commercial boiler-water treatment.
Storage: 189,000 gal in two wooden tanks near the roundhouse and one near Baxter.
Total distribution of water for average year: 87,600,000 gal.
Average daily pumpage: 240,000 gal.
Remarks: The water is used for steam generation in locomotives.

Lynch

Population served: 7,952.
Ownership: United States Steel Co.
Source: Big Looney Creek, about 1 mile east of the Lynch Post Office.
Treatment: Coagulation with iron and lime; sedimentation; filtration; chlorination.
Capacity of treatment plant: 1,000,000 gpd.
Storage: Raw water, 150,000,000 gal in abandoned coal mine; finished water, 50,000 gal in clear well.
Total distribution of water for 1950: 292,000,000 gal.
Average daily pumpage, 1950: 800,000 gal.
Remarks: Water from Big Looney Creek flows through

a borehole into an abandoned mine, then to the treatment plant by gravity. After flowing through the treatment plant, the water is pumped to the distribution system.

Analysis, in parts per million, Big Looney Creek, finished water

(Collected May 10, 1951)

Silica (SiO_2)	5.3
Iron (Fe)	.24
Manganese (Mn)	.00
Calcium (Ca)	14
Magnesium (Mg)	3.4
Sodium (Na)	24
Potassium (K)	1.6
Bicarbonate (HCO_3)	100
Sulfate (SO_4)	21
Chloride (Cl)	2.2
Fluoride (F)	.1
Nitrate (NO_3)	1.5
Dissolved solids	118
Hardness as $CaCO_3$	
Total	48
Noncarbonate	0
pH	7.6
Specific conductance at 25° C (micromhos)	200

Three Point

Population served: 320.
Ownership: Three Point Coal Corp.
Source: Three wells with electric pumps, two wells with hand pumps.
Well 8315–3645–7, at the bathhouse, 0.1 mile southwest of the Three Point Post Office. Depth, 190 ft; diameter, 4 in.; water-bearing strata, sandstone in undifferentiated post-Lee rocks of Pennsylvanian age; static water level, 30 ft below ground; yield, about 15 gpm.
Well 8315–3645–8, 0.1 mile northwest of the Three Point Post Office. Depth, 190 ft; diameter, 4 in.; static water level, 60 ft below ground.
Well 8315–3645–10, 0.2 mile northwest of the Three Point Post Office. Depth, 100 ft; diameter, 4 in.; static water level, 30 ft below ground.
Well 8315–3645–11, near schoolhouse, 0.2 mile northeast of the Three Point Post Office. Depth, 50 ft; diameter, 4 in.
Well 8315–3645–12, 0.5 mile northeast of the Three Point Post Office. Depth, 50 ft; diameter, 4 in.
Treatment: Chlorination.
Storage: 35,000 gal.

Twila

Population served: 350.
Ownership: Creech Coal Co.
Source: Two wells with electric pumps; three wells with hand pumps.
Well 8320–3645–3, at Twila Post Office. Depth, 250 ft; diameter, 6 in.; static water level, 75 ft below ground.
Well 8320–3645–4, 0.6 mile northeast of the Twila Post Office. Depth, 125 ft; static water level, 40 ft below ground.
Treatment: Chlorination.
Storage: 10,000 gal.

Verda

Population served: 140.
Ownership: Harlan Wallins Coal Corp.
Source: One mine, on the left bank of Jones Creek, about 1 mile from the mouth.
Mine 8310–3650–1. Water-bearing strata, coal (Harlan seam) in undifferentiated post-Lee rocks of Pennsylvanian age.

Yancey

Population served: 600.
Ownership: Harlan Fuel Co.
Source: Ten wells with electric pumps; one mine.
Treatment: None.

JACKSON COUNTY

Annville

Population served: Boarding students and faculty, 175; day students, 30; total, 205.
Ownership: Annville Institute.
Source: Impounding reservoir, 1,400 ft northeast of the powerplant.
Treatment: Chlorination and filtration, at the powerplant.
Capacity of treatment plant: 48,000 gpd.
Storage: 100,000 gal in concrete reservoir on hillside, 1,600 ft north of the powerplant.
Total distribution of water for average year: 3,650,000 gal.
Average daily pumpage: 10,000 gal.
Remarks: Water flows from the impounding reservoir to the powerhouse and through the filters, is pumped from the filters to the storage reservoir, and flows from the reservoir to the distribution system.

JOHNSON COUNTY

Paintsville

Population served: 4,450.
Ownership: Municipal.
Source: Levisa Fork of the Big Sandy River, 0.8 mile east of the Paintsville Post Office.
Treatment: Coagulation with alum and lime; chlorination; fluoridation; rapid sand filtration; final adjustment of pH by addition of lime.
Capacity of treatment plant: 1,008,000 gpd.
Storage: 535,000 gal in clear well and two steel tanks on hillside in northwest Paintsville.
Total distribution of water for 1951: 113,865,000 gal.
Maximum monthly (July) ..... 10,500,000 gal
Minimum monthly (January) ..... 7,690,000 gal
Breakdown of annual distribution as to use, 1951:
Domestic ..... 104,066,000 gal
Other public uses ..... 8,816,000 gal
Leakage and waste ..... 1,295,000 gal
Average daily pumpage: 312,000 gal.
Remarks: Water is pumped from the river to the treat-

ment plant, flows through the plant to the clear well, and is pumped from the well to the distribution system and storage tanks.

Regular determinations at treatment plant, 1951

Determination	Finished water		
	Avg	Max	Min
pH	7.7	8.4	7.2

Average daily pumpage in gallons, by months, 1951

January	248,000	July	338,000
February	332,000	August	332,000
March	308,000	September	342,000
April	337,000	October	293,000
May	304,000	November	300,000
June	310,000	December	302,000

Paintsville, Chesapeake & Ohio Railway Co.

Ownership: Chesapeake & Ohio Railway Co.
Source: Levisa Fork of the Big Sandy River, 8245–3745–A, about 0.2 mile south of the Paintsville Water Works.
Treatment: Commercial boiler-water treatment.
Storage: 560,000 gal in two standpipes.
Total distribution of water for 1951: 85,731,000 gal.
Maximum monthly (December)... 7,769,000 gal
Minimum monthly (July)..... 5,567,000 gal
Average daily pumpage, 1951: 235,000 gal.
Remarks: Most of the water is used for generating steam in locomotives. The water is pumped from the river to a standpipe where it is partially treated, flows from this standpipe to a second standpipe where the treatment is completed, and flows from the second standpipe to the supply house and locomotives.

Average daily pumpage in gallons, by months, 1951

January	248,000	July	180,000
February	235,000	August	219,000
March	236,000	September	224,000
April	240,000	October	257,000
May	246,000	November	248,000
June	240,000	December	251,000

Van Lear

Population served: 1,096; Hager Hill, 50; total, 1,146.
Ownership: Kentucky Water Co., Jenkins, Ky.
Source: Levisa Fork of the Big Sandy River near State Route 302, 2 miles west of the Van Lear Post Office.
Treatment: Coagulation with alum and lime; rapid sand filtration; chlorination.
Capacity of treatment plant: 360,000 gpd.
Storage: 122,000 gal in two clear wells and two wooden tanks located on hillside east of the treatment plant and on hillside 2 miles east of the treatment plant.
Total distribution of water for 1951 (estimated): 25,550,000 gal.
Average daily pumpage, 1951: 70,000 gal.
Remarks: Water is pumped from the river to the treatment plant, flows through the plant to the clear wells, and is pumped from the wells to the distribution system and storage tanks.

Regular determinations at treatment plant, April–September 1951

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	37	60	14.0	35	66	10
pH	6.9	7.6	6.0	8.1	8.4	7.2
Hardness as $CaCO_3$ (ppm)	54.8	101	31	114	171	62

KNOTT COUNTY

Anco, Blue Bird Mining Co.

Ownership: Blue Bird Mining Co.
Source: One mine, 2 miles north of the Sassafras Post Office.
Storage: 3,000 gal in a steel tank.
Remarks: The water is used for washing coal.

Anco, Knott Coal Corp.

Ownership: Knott Coal Corp.
Source: One mine, 1.6 miles northeast of the Sassafras Post Office.
Mine 8300–3710–5. Water-bearing strata, coal (No. 4 seam) in the Breathitt formation.
Treatment: None.
Storage: 35,000 gal in three wooden tanks.
Total distribution of water for average year: 17,500,000 gal.
Average daily pumpage, when in operation: 70,000 gal.
Remarks: The water is used for washing coal. Water from the mine is pumped to the storage tanks, flows from the tanks through the washing plant, and is discharged into a nearby stream.

Analysis, in parts per million, mine 8300–3710–5

(Collected Feb. 24, 1953)

Silica (SiO_2)	7.9
Iron (Fe)	7.5
Manganese (Mn)	.89
Calcium (Ca)	80
Magnesium (Mg)	39
Sodium (Na)	308
Potassium (K)	9.8
Bicarbonate (HCO_3)	559
Sulfate (SO_4)	563
Chloride (Cl)	9.2
Fluoride (F)	.3
Nitrate (NO_3)	3.5
Dissolved solids	1,284
Hardness as $CaCO_3$	
Total	362
Noncarbonate	0
Temperature (°F)	51

Analysis, in parts per million, mine 8300–3710–5—Con.

pH	6.4
Specific conductance at 25° C (micromhos)	1,850

Hindman

Population served: 700.
Ownership: Hindman Settlement School, Inc.
Source: Two wells. A well drilled in July 1953 will replace the present well.

Well 8255–3720-1, inside the maintainance building (to be abandoned). Depth, 177 ft; diameter, 5 in.; date drilled, 1937; water-bearing strata, sandstone in the Breathitt formation; yield, 30+ gpm.

Well 8255–3720–2, 300 ft west of maintainance building (to replace well 8255–3720–1). Depth, 194 ft; diameter, 6 in.; date drilled, July 1953; water-bearing strata, sandstone and shale in the Breathitt formation; static water level, 26.03 ft below ground on September 23, 1953; yield, 39 gpm; specific capacity, 4 gpm per ft after 9 minutes bailing at an average rate of 22 gpm.

Treatment: Chlorination (when needed).
Storage: 51,000 gal in covered concrete tank.
Total distribution of water for average year: 3,249,000 gal.
Average daily pumpage, when school is in session: 12,000 gal.
Remarks: Water is pumped from the well to the storage reservoir and flows from the reservoir to the distribution system.

Analysis, in parts per million, well 8255–3720–1

(Date collected, 1953)

	Apr. 13	June 15
Silica (SiO_2)	14	13
Iron (Fe)	.48	3.5
Manganese (Mn)	.00	.18
Calcium (Ca)	4.8	8.8
Magnesium (Mg)	1.7	2.7
Sodium (Na)	120	91
Potassium (K)	1.3	2.1
Bicarbonate (HCO_3)	298	233
Sulfate (SO_4)	9.7	17
Chloride (Cl)	24	22
Fluoride (F)	.5	.3
Nitrate (NO_3)	1.2	.0
Dissolved solids	327	268
Hardness as $CaCO_3$		
Total	19	33
Noncarbonate	0	0
Temperature (° F)	57	58
pH	7.5	7.1
Specific conductance at 25° C (micromhos)	542	451

Analysis, in parts per million, well 8255–3720–2

(Collected Sept. 23, 1953)

Silica (SiO_2)	17
Iron (Fe)[1]	.22
Manganese (Mn)	0.00
Calcium (Ca)	9.8
Magnesium (Mg)	1.7
Sodium (Na)	96
Potassium (K)	3.0
Bicarbonate (HCO_3)	260
Sulfate (SO_4)	11
Chloride (Cl)	18
Fluoride (F)	.3
Nitrate (NO_3)	1.1
Dissolved solids	276
Hardness as $CaCO_3$	
Total	32
Noncarbonate	0
Temperature (° F)	58
pH	7.6
Specific conductance at 25° C (micromhos)	458

[1] In solution and sediment.

Kentucky-West Virginia Gas Co.

Ownership: Kentucky-West Virginia Gas Co.
Source: One well, on southwest side of State Route 7, about 4 miles southeast of Wayland (Floyd County); Right Fork of Beaver Creek, 8245–3720–A, on State Route 7, about 4 miles southeast of Wayland (Floyd County).

Well 8245–3720–1. Depth, 52 ft; diameter, 6 in.; date drilled, 1946; water-bearing strata, sandstone in the Breathitt formation; static water level, 26 ft below ground when drilled.

Treatment: None.
Storage: 21,000 gal.
Total distribution of water for average year: 315,433,000 gal.
From stream..... 315,360,000 gal
From well..... 78,000 gal
Average daily pumpage: 864,000 gal.
From stream..... 864,000 gal
From well..... 200 gal
Remarks: The water is used for cooling compressor engines.

Wiscoal

Population served: 25.
Ownership: Wisconsin Coal Corp., Inc.
Source: Two mines, 1 mile north of the Sassafras Post Office.

Mine 8300–3710–6 (industrial supply). Water-bearing strata, coal (No. 7 seam) in the Breathitt formation.

Mine 8300–3710–7 (domestic supply). Water-bearing strata, coal (No. 4 seam) in the Breathitt formation.

Remarks: Water from mine 8300–3710–6 is used to wash coal and the water from mine 8300–3710–7 to supply six dwellings.

KNOX COUNTY

Baileys, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: Richland Creek, 8350–3650–B, 0.2 mile west of U. S. 25E and 0.9 mile northwest of intersection of U. S. 25E and State Route 11.
Treatment: Commercial boiler-water treatment.

Storage: 63,000 gal in tank at the intake.
Average daily pumpage, when in operation: 72,000 gal.
Remarks: The water is used for generating steam in locomotives.

Barbourville

Population served: 3,025.
Ownership: Municipal.
Source: Cumberland River, 0.3 mile east of the Barbourville Post Office.
Treatment: Coagulation with alum and lime; rapid sand filtration; chlorination.
Capacity of treatment plant: 300,000 gpd. Capacity will be increased to 600,000 gpd when new plant is put into operation.
Storage: 200,000 gal in clear well and steel tank on hillside north of Barbourville. The storage will be increased to 450,000 gal when a new steel tank on a hillside south of Barbourville is put into use.
Total distribution of water for 1951: 58,627,000 gal.
Maximum monthly (August)..... 5,202,000 gal
Minimum monthly (March)..... 4,517,000 gal
Breakdown of annual distribution as to use:
Domestic..... 24,402,000 gal
Industrial and commercial..... 25,941,000 gal
Other public uses..... 1,657,000 gal
Leakage and waste..... 6,535,000 gal
Average daily pumpage, 1951: 160,000 gal
Remarks: Water is pumped from the river to the treatment plant, flows through the treatment plant to the clear well, and is pumped from the clear well to the distribution system and storage tanks.

Average daily pumpage in gallons, by months, 1951

January	148,000	July	165,000
February	181,000	August	168,000
March	146,000	September	151,000
April	157,000	October	161,000
May	164,000	November	160,000
June	171,000	December	153,000

Barbourville, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: Cumberland River, 8350–3650–A, 0.2 mile southwest of the railroad depot on Cumberland Avenue in Barbourville.
Treatment: Commercial boiler-water treatment.
Storage: 114,000 gal in two storage tanks located at the railroad depot in Barbourville.
Total distribution of water for average year: 21,900,000 gal.
Average daily pumpage: 60,000 gal.
Remarks: The water is used for steam generation in locomotives.

LAUREL COUNTY

London

Population served: 3,525.
Ownership: Municipal.
Source: Sinking Creek and Long Branch impounded, 4 miles southwest of London.
Treatment: Coagulation with alum and lime; chlorination. The treatment plant is $2\frac{1}{2}$ miles southwest of London.
Capacity of treatment plant: 800,000 gpd.
Storage: Raw water, 11,000,000 to 12,000,000 gal in impounding reservoir; finished water, 148,000 gal.
Total distribution of water for 1950: 49,000,000 gal.
Breakdown of annual distribution as to use (approximate):
Domestic..... 22,100,000 gal
Industrial and commercial, and other public uses..... 26,900,000 gal
Average daily pumpage, 1950: 134,000 gal.

Regular determinations at treatment plant, February–December 1950

Determination	Finished water		
	Avg	Max	Min
pH	7.3	8.2	6.6

LAWRENCE COUNTY

Louisa

Population served: 2,050.
Ownership: Municipal.
Source: Levisa Fork of the Big Sandy River, at Louisa.
Treatment: Coagulation with alum and lime; rapid sand filtration; chlorination.
Capacity: 500,000 gpd.
Storage: Finished water, 24,000 gal in clear well, 150,000 gal in standpipe on Gumberry Hill, 800 yards from plant.
Total distribution of water for 1951: 24,365,100 gal.
Breakdown of annual distribution as to use (estimated):
Domestic..... 19,700,000 gal
Industrial and commercial..... 2,045,000 gal
Other public uses..... 120,000 gal
Leakage and waste..... 2,500,000 gal
Average daily pumpage, 1951: 67,000 gal.
Remarks: Water is pumped from the river, flows through the treatment plant, and is pumped into the distribution system and standpipe.

Regular determinations at treatment plant, 1951

Determination	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
pH	7.1	7.2	6.8	7.4	7.6	7.0

Average daily pumpage in gallons, by months, 1951

January	62,000	July	70,000
February	82,000	August	62,000
March	63,000	September	74,000
April	72,000	October	68,000
May	54,000	November	69,000
June	66,000	December	62,000

LEE COUNTY

Beattyville

Population served: 1,042.
Ownership: Municipal.
Source: North Fork of the Kentucky River, 0.4 mile east of the courthouse in Beattyville.
Treatment: Coagulation with alum and lime; rapid sand filtration; chlorination.
Capacity of treatment plant: 320,000+ gal.
Storage: 85,000 gal in a covered concrete tank on hillside north of Beattyville.
Average daily pumpage: 54,000 gal.
Remarks: Water is pumped from the river to the treatment plant, flows through the plant to the clear well, and is pumped from the well to the distribution system and storage tank.

Average daily pumpage in gallons, by months, 1951–52

July 1951	53,000	January 1952	53,000
August	58,000	February	54,000
September	64,000	March	47,000
October	57,000	April	48,000
November	52,000	May	51,000
December	54,000		

Fixer, Ashland Oil & Refining Co.

Ownership: Ashland Oil & Refining Co.
Source: Big Sinking Creek, 8340–3740–B, 0.7 mile south of the Fixer Post Office.
Treatment: The addition of soda ash to the boiler water.
Storage: 153,000 gal.
Remarks: Most of the water is used for cooling compressor engines; some is used in the boiler.

Leeco

Population served: 230.
Ownership: Petroleum Exploration Co.
Source: One well at Leeco; one cistern.
Well 8340–3740–2. Depth, 340 ft; water-bearing strata, sandstone and limestone in the Lee formation; yield, 2 gpm.
Treatment: Chlorination.
Storage: 4,200 gal.
Total distribution of water for average year: 1,260,000 gal.
Average daily pumpage: 3,000 gal.

Leeco, Preston Oil Co.

Ownership: Preston Oil Co.
Source: Little Sinking Creek impounded, 8340–3740–A, about 4.8 miles west of the Leeco Post Office.
Treatment: Coagulation with alum and lime; addition of Calgon; filtration (by pressure); chlorination.
Capacity of treatment plant: 216,000 gpd.
Storage: Raw water, 5,670,000 gal in an impounding reservoir; finished water, 21,000 gal in a steel tank.
Total distribution of water for average year: 9,964,000 gal.
Average daily pumpage: 27,000 gal.
Remarks: The water is used for the secondary recovery of petroleum. Pumpage will increase as more intake wells are drilled.

Heidelberg, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: Kentucky River, 8345–3730–A, at Lock 14.
Treatment: Commercial boiler-water treatment.
Storage: About 190,000 gal.

LESLIE COUNTY

Hyden, Leslie County High School

Population served: 880.
Ownership: Leslie County High School.
Source: Two wells, at the school.
Well 8320–3705–2. Depth, 150(?) ft; diameter, 6 in.; date drilled, 1937; water-bearing strata, Breathitt formation.
Well 8320–3705–3. Depth, 150(?) ft; diameter, 6 in.; date drilled, 1946; water-bearing strata, Breathitt formation.
Treatment: Chlorination (occasional).
Total distribution of water for average year: 2,700,000 gal.
Average daily pumpage, when in operation: 15,000 gal.
Remarks: Water is pumped from the wells to a pressure storage tank and flows from the tank to the distribution system.

Hyden, Mary Parker Gill Hospital

Population served: 50.
Ownership: Mary Parker Gill Hospital, Frontier Nursing Service.
Source: One well, 0.4 mile west of the Hyden Post Office.
Well 8320–3705–1. Depth, 196 ft; diameter, 5 in.; water-bearing strata, Breathitt formation; static water level, 59 ft below ground; yield, about 15 gpm.
Treatment: The addition of chlorinated lime.
Storage: 33,000 gal.

LETCHER COUNTY

Colson, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: One well, 0.3 mile southwest of State Route 7, at Colson.
Well 8250–3710–1. Depth, 90 to 100 ft; diameter, 8 in.; water-bearing strata, sandstone in the Breathitt formation; static water level, 22 ft below ground; yield, 45 gpm; specific capacity, $6\frac{1}{2}$ gpm per foot after 4 to 5 hr pumping at 45 gpm.
Remarks: The water is used for generating steam in locomotives.

Deane, Consolidation Coal Co. (Ky.), Division of Pittsburgh Consolidation Coal Co.

Ownership: Consolidation Coal Co. (Ky.), Division of Pittsburgh Consolidation Coal Co.
Source: Four wells, 0.4 mile southwest of the Deane Post Office.
Well 8245–3710–2. Depth, 325 ft; diameter, 10 in.; date drilled, 1948 or 1949; water-bearing strata, Breathitt formation.
Well 8245–3710–3. Depth, 285 ft; diameter, 10 in.; date drilled, 1948; water-bearing strata, Breathitt formation; static water level, 13 ft below ground, October 21, 1948; yield, 250 gpm; specific capacity, 1.7 gpm per foot after 97 hr pumping at an average rate of 215 gpm.
Well 8245–3710–4. Depth, 303 ft; diameter, 10 in.; date drilled, 1948; water-bearing strata, Breathitt formation; static water level, 25 ft below ground, October 7, 1948; yield, 300 gpm.
Well 8245–3710–6. Depth, 320 ft; diameter, 10 in.; date drilled, 1948; water-bearing strata, Breathitt formation; static water level, 4 ft below ground, December 30, 1948; yield, 300 gpm; specific capacity, 23 gpm per foot after 238½ hr pumping at 300 gpm.
Treatment: Filtration; chlorination (domestic supply).
Capacity of treatment plant: 36,000 gpd.
Storage: Raw water, 300,000 gal in three steel tanks; finished water, 50,000 gal in one steel tank.
Total distribution of water for average year: 36,000,000 gal.
Average daily pumpage, when in operation: 144,000 gal.
Remarks: Most of the water is used for washing coal. The water is pumped from the wells to the storage tanks and flows from the tanks to the distribution system. Ordinarily only one well is pumped at a time; pumping is controlled by a float gage in the storage tanks. Two wells, without pumps and not listed as part of the supply, could be used in emergency.

Analysis, in parts per million, well 8245–3710–4

(Collected Jan. 27, 1953)

Silica (SiO_2)	14
Iron (Fe)	3.6
Manganese (Mn)	.92
Calcium (Ca)	61
Magnesium (Mg)	19
Sodium (Na)	48
Potassium (K)	2.7
Bicarbonate (HCO_3)	154
Sulfate (SO_4)	160
Chloride (Cl)	30
Fluoride (F)	.2
Nitrate (NO_3)	2.5
Dissolved solids	426
Hardness as $CaCO_3$	
Total	232
Noncarbonate	104
Temperature (° F)	51
pH	7.1
Specific conductance at 25° C (micromhos)	632

Haymond

Population served: 260.
Ownership: Letcher Realty Co.
Source: One well, 300 ft northeast of the theater and recreation building.
Well 8240–3710–3. Depth, 90 ft; diameter, 7 in.; date drilled, 1945; water-bearing strata, Breathitt formation; static water level, 40 ft below ground.
Treatment: None.
Storage: 1,000-gal tank behind well.
Total distribution of water for average year: 3,285,000 gal.
Breakdown of annual distribution as to use:
Domestic..... 3,200,000 gal
Industrial and commercial..... 100,000 gal
Average daily pumpage, any year: 9,000 gal.
Remarks: Water is pumped from well into the tank, and flows to distribution system by gravity.

Analysis, in parts per million, well 8240–3710–3

(Collected July 29, 1952)

Silica (SiO_2)	18
Iron (Fe)	1.5
Manganese (Mn)	.00
Calcium (Ca)	27
Magnesium (Mg)	9.7
Sodium (Na)	51
Potassium (K)	3.0
Bicarbonate (HCO_3)	219
Sulfate (SO_4)	20
Chloride (Cl)	20
Fluoride (F)	.1
Nitrate (NO_3)	.1
Dissolved solids	263
Hardness as $CaCO_3$	
Total	108
Noncarbonate	0
Temperature (° F)	60
pH	7.0
Specific conductance at 25° C (micromhos)	440

Hemphill

Population served: 160.
Ownership: Elkhorn Coal Corp.
Source: Mine 8240–3710–10 at Hemphill.
Treatment: Chlorination (drinking water).
Storage: 5,000 gal in wooden tank on hillside.
Remarks: The water is used for both domestic purposes and washing coal. The water flows from the mine to the distribution system. The storage tank is used for fire protection.

Jenkins

Population served: 7,200; Fleming, 600; total, 7,800.
Ownership: Kentucky Water Co.
Source: One mine, 0.6 mile east of the McRoberts Post Office; two wells; Elkhorn Lake in the south part of Jenkins.

Source—Continued
Mine 8235–3710–7. Water-bearing strata, "slate" and coal in the Breathitt formation.
Well 8235–3710–8, 0.1 mile northeast of the Jenkins Post Office (standby). Depth, 140 ft; diameter, 6 in.; date drilled, between 1932 and 1937; water-bearing strata, Breathitt formation; yield, 220 gpm.
Well 8240–3710–10, 1.6 miles northwest of the McRoberts Post Office (standby). Depth, 131 ft; water-bearing strata, coal in the Breathitt formation (well taps abandoned coal mine); yield, 240 gpm.

Treatment: Water from mine 8235–3710–7 is treated at the No. 214 plant in Tom Biggs Hollow by chlorination. Water from well 8235–3710–8 is treated at the No. 203 plant in the Burdine section of Jenkins by the addition of lime and chlorination. The water from well 8240–3710–10 is treated at the No. 212 plant in Sheas Fork by chlorination. Water from Elkhorn Lake is treated at the Jenkins Central Plant by coagulation with alum and lime; by carbon for removal of taste and odors; filtration; chlorination.

Capacity of treatment plants: Jenkins Central Plant, 1,152,000 gpd; No. 214 Plant, 288,000 gpd; No. 212 Plant, 216,000 gpd; No. 203 Plant, 288,000 gpd.

Storage: Raw water, 120,000,000 gal in No. 204 mine and No. 214 mine, 40,000,000 gal in Elkhorn Lake; finished water, 20,000 gal in clear well at Jenkins Central Plant, 8,000 gal in clear well at No. 214 Plant, 500,000 gal in tank at Lakeside District, 50,000 gal in tank in Dunham No. 7 mine, 50,000 gal in tank at Jenkins No. 204 mine, 18,000 gal in tank at Rice Hollow, 12,000 gal in tank at Mudtown, 34,000 gal in tank at East Jenkins, 300,000 gal in tank in No. 203 Hollow at Burdine, 50,000 gal in tank at Tom Biggs Hollow, 50,000 gal in tank at Chopping Branch, and 50,000 gal in tank at East Fleming.

Total distribution of water for 1951: 269,710,000 gal.
Maximum monthly (January)..... 25,665,000 gal
Minimum monthly (April)..... 19,723,000 gal

Average daily pumpage, 1951: 739,000 gal.
From lake..... 467,000 gal
From mine and wells..... 272,000 gal

Remarks: Water flows by gravity from Elkhorn Lake through the treatment plant, is pumped from the Lakeside District tank to booster tanks and reserve storage tank in No. 203 Hollow at Burdine, and flows by gravity to the distribution system. Water flows by gravity from mine 8235–3710–7, flows through the No. 214 filter plant, is pumped to the Chopping Branch and Tom Biggs Hollow tanks, and flows by gravity to the distribution system. The East Fleming tank is filled by gravity flow from tanks in McRoberts. Water from well 8235–3710–8 is pumped to the No. 203 plant at Burdine, flows through the treatment plant, is pumped to the East Jenkins and No. 203 Hollow tanks, and flows by gravity to the distribution system. Water is pumped from well 8240–3710–10 to the No. 212 treatment plant in Sheas Fork, flows through the plant, is pumped to the Chopping Branch and Tom Biggs Hollow tanks, flows by gravity into the East Fleming tank and Neon tank (Neon supply added to system about December 1, 1952), and through the distribution system by gravity.

Regular determinations at treatment plant, 1951

(Jenkins Central Plant only)

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)	76.5	98	61	93.0	120	72
pH	7.3	8.2	7.0	7.9	8.8	7.2
Hardness as $CaCO_3$ (ppm)	87.3	122	61	115.8	152	78

Average daily pumpage in gallons, by months, 1951

January	828,000	July	751,000
February	865,000	August	721,000
March	694,000	September	713,000
April	657,000	October	645,000
May	719,000	November	763,000
June	708,000	December	813,000

Analysis, in parts per million, mine 8235–3710–7

(Collected Aug. 5, 1953)

Silica (SiO_2)	8.9
Iron (Fe)	.22
Manganese (Mn)	.00
Calcium (Ca)	82
Magnesium (Mg)	33
Sodium (Na)	236
Potassium (K)	9.3
Bicarbonate (HCO_3)	620
Sulfate (SO_4)	297
Chloride (Cl)	14
Fluoride (F)	.1
Nitrate (NO_3)	1.3
Dissolved solids	952
Hardness as $CaCO_3$	
Total	340
Noncarbonate	0
Temperature (°F)	58
pH	7.7
Specific conductance at 25°C (micromhos)	1,470

Analysis, in parts per million, well 8240–3710–10

(Collected Aug. 5, 1953)

Silica (SiO_2)	10
Iron (Fe)	2.8
Manganese (Mn)	.00
Calcium (Ca)	64
Magnesium (Mg)	28
Sodium (Na)	70
Potassium (K)	7.3
Bicarbonate (HCO_3)	284
Sulfate (SO_4)	181
Chloride (Cl)	5.1

Analysis, in parts per million, well 8240–3710–10—Con.

Fluoride (F)	0.0
Nitrate (NO_3)	2.9
Dissolved solids	488
Hardness as $CaCO_3$	
Total	274
Noncarbonate	42
Temperature (° F)	63
pH	7.2
Specific conductance at 25° C (micromhos)	788

Jenkins, Consolidation Coal Co. (Ky.), Division of Pittsburgh Consolidation Coal Co.

Ownership: Consolidation Coal Co. (Ky.), Division of Pittsburgh Consolidation Coal Co.
Source: One mine.
Mine 8235–3710–1. Water-bearing strata, coal (Elkhorn No. 3 seam) in the Breathitt formation.
Treatment: None.
Storage: Raw water, 2,550,000 gal in seven collecting sumps in coal mine; 300,000 gal in four steel storage tanks on hillside above coal-washing plant. Standby storage, 700,000 gal in natural basin in mine.
Total distribution of water for average year: 216,000,000 gal.
Average daily pumpage, when in operation: 864,000 gal.
Remarks: The water is used for washing coal. Water is pumped from the coal mine to the storage tanks and flows from the tanks through the washing plant. Water overflows the storage tanks and discharges into a nearby stream. Five standby wells (8235–3710–2 through 6) are never used.

Analysis, in parts per million, mine 8235–3710–1

(Collected Jan. 28, 1953)

Silica (SiO_2)	8.3
Iron (Fe)	.03
Manganese (Mn)	.00
Calcium (Ca)	59
Magnesium (Mg)	27
Sodium (Na)	160
Potassium (K)	7.3
Bicarbonate (HCO_3)	532
Sulfate (SO_4)	163
Chloride (Cl)	10
Fluoride (F)	.2
Nitrate (NO_3)	2.4
Dissolved solids	710
Hardness as $CaCO_3$	
Total	260
Temperature (° F)	59
pH	5.3
Specific conductance at 25° C (micromhos)	1,090

Jenkins, Letcher Theater Corp.

Ownership: Letcher Theater Corp.
Source: One well in alley behind theater on U. S. 119 in Jenkins.
Well 8235–3710–9. Depth, 170 ft; diameter, 8 in.; date drilled, 1949; water-bearing strata, sandstone and shale in the Breathitt formation; static water level, 10 ft below ground, 1949; yield, 150 gpm.
Treatment: None.
Storage: 200 gal.
Total distribution of water for average year: 6,936,000 gal.
Average daily pumpage, when in operation: 58,000 gal.
Remarks: The water is used for air conditioning during the summer.

Kona

Population served: 400.
Ownership: Elkhorn Coal Co.
Source: Two wells with electric pumps, five or six wells with hand pumps.
Well 8240–3705–1, 300 ft east of the office building. Diameter, 5 in.; date drilled, about 1920; water-bearing strata, Breathitt formation.
Well 8240–3705–2, 200 ft north of the office building. Depth, 115 ft; diameter, 6 in.; water-bearing strata, Breathitt formation.
Treatment: None.
Storage: Two pressure tanks, each about 50 gal capacity, at wells 8240–3705–1 and 2.
Total distribution of water for 1951: 1,825,000 gal.
Average daily pumpage, 1951: 5,000 gal.
Remarks: Water from well 8240–3705–1 supplies about seven families; water from well 8240–3705–2 supplies two families. Wells with hand pumps supply other families in the town.

Millstone

Population served: 250.
Ownership: Southeast Coal Co.
Source: One well, south of junction of State Routes 113 and 119.
Well 8245–3710–1. Depth, 210 ft; diameter, 6 in.; water-bearing strata, Breathitt formation; static water level, 30(?) ft below ground.
Treatment: Chlorination.
Storage: 20,000 gal in tank on hillside above well.
Total distribution of water for 1951: 2,555,000 gal.
Average daily pumpage, 1951: 7,000 gal.
Remarks: Water is pumped from the well into the tank, and flows through the distribution system by gravity.

Neon

Population served: 1,000.
Ownership: Neon Water Co.
Source: Two wells, about 6 ft apart and 500 ft north of junction of State Routes 314 and 343.
Well 8240–3710–5. Depth, 125 ft; diameter, 5 in.; date drilled, 1928; water-bearing strata, sandstone in the Breathitt formation; static water level, 14 ft below ground; yield, 100 gpm.
Well 8240–3710–6. Depth, 90 ft; diameter, 5 in.; date drilled, 1940; water-bearing strata, sandstone in the Breathitt formation; static water level, 14 ft below ground.
Treatment: Chlorination (occasional).
Storage: 72,000-gal tank.
Total distribution of water for 1951: 25,550,000 gal.
Average daily pumpage, 1951: 70,000 gal.
Remarks: Water from the wells is pumped into the tank and distribution system. Water from the tank flows to the distribution system by gravity. About Decem-

ber 1, 1953, use of the wells was discontinued and the city of Neon supplied from Jenkins.

Neon, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: One well, 0.2 mile south of the Neon Post Office and about 250 ft east of State Route 317 near the depot; impounding reservoir, 8240–3710–A, on hillside east of the railroad depot at Neon.
Well 8240–3710–17 (standby). Depth, 75 ft; diameter, 6 in.; water-bearing strata, sandstone in the Breathitt formation; static water level, 3 ft below ground; yield, 166 gpm.
Treatment: Commercial boiler-water treatment.
Storage: Raw water, 70,000 gal.
Total distribution of water for average year: 325,000 gal.
Average daily pumpage: 13,000 gal.
Remarks: The water is used for generating steam in locomotives. Water flows from the impounding reservoir to the storage tanks, and is treated as it flows from the tanks to the locomotives.

Seco

Population served: 445.
Ownership: Southeast Coal Co.
Source: One well, near No. 1 mine tipple; small pond, 8240–3710–B, above No. 1 mine tipple.
Well 8240–3710–1. Depth, 220 ft; diameter, 6 in.; date drilled, 1930; water-bearing strata, shale in the Breathitt formation; static water level, 30(?) ft below ground.
Treatment: None.
Storage: Raw water, 20,000 gal in tank on hill and unknown quantity in pond.
Total distribution of water for 1951: 3,744,000 gal.
Breakdown of annual distribution as to use:

Domestic	3,255,000 gal
Industrial and commercial	500,000 gal

Average daily pumpage, 1951: 10,000 gal.

From well	9,000 gal
From pond	1,000 gal

Remarks: Water from the well, used only for domestic purposes, is pumped to the elevated tank and flows by gravity to the distribution system. Water from the pond is used for the bathhouse and heating system.

Analysis, in parts per million, well 8240–3710–1

(Collected July 17, 1952)

Silica (SiO_2)	11
Iron (Fe)	.64
Manganese (Mn)	.15
Calcium (Ca)	48
Magnesium (Mg)	14
Sodium (Na)	83
Potassium (K)	2.3
Bicarbonate (HCO_3)	278
Sulfate (SO_4)	65
Chloride (Cl)	52
Fluoride (F)	.1
Nitrate (NO_3)	.1
Dissolved solids	418
Hardness as $CaCO_3$	
Total	178
Noncarbonate	0
Temperature (°F)	58
pH	7.3
Specific conductance at 25°C (micromhos)	715

Whitesburg

Population served: 1,393; Caudill, 140; total, 1,533.
Ownership: Municipal.
Source: Two wells, behind the Boone Motor Co. building.
Well 8245–3705–1. Depth, 180 ft; diameter, 4 in.; date drilled, about 1920; water-bearing strata, Breathitt formation; static water level, 60 ft below ground; yield, 150 gpm.
Well 8245–3705–2. Depth, 180 ft; diameter, 4 in.; date drilled, about 1920; water-bearing strata, Breathitt formation; static water level, 60 ft below ground; yield, 150 gpm.
Treatment: Aeration; chlorination. The treatment plant is located behind the Whitesburg High School.
Capacity of treatment plant: 350,000 gpd.
Storage: 90,000-gal tank behind the high school, 150,000-gal tank behind Boone Motor Co. building.
Total distribution of water for 1952: 36,500,000 gal.
Breakdown of annual distribution as to use:

Domestic	27,380,000 gal
Industrial and commercial	8,520,000 gal
Other public uses	600,000 gal

Average daily pumpage, 1952: 100,000 gal.
Remarks: Water is pumped from the wells to the treatment plant, flows through the plant, is pumped to the tank behind the high school, from there to the tank behind the Boone Motor Co. building, and flows by gravity to the distribution system.

Analysis, in parts per million, well 8245–3705–2

(Collected July 16, 1952)

Silica (SiO_2)	10
Iron (Fe)	1.4
Manganese (Mn)	.28
Calcium (Ca)	27
Magnesium (Mg)	9.2
Sodium (Na)	174
Potassium (K)	7.0
Bicarbonate (HCO_3)	291
Sulfate (SO_4)	11
Chloride (Cl)	176
Fluoride (F)	.4
Nitrate (NO_3)	.0
Dissolved solids	558
Hardness as $CaCO_3$	
Total	106
Noncarbonate	0
Temperature (°F)	58
pH	7.1
Specific conductance at 25°C (micromhos)	1,020

MAGOFFIN COUNTY

Oil Springs, Cumberland Petroleum Co.

Ownership: Cumberland Petroleum Co.

Source: Four wells, about 0.2 mile north of U. S. 460 and about 2 miles west of the Oil Springs Post Office (Johnson County).
Well 8255–3745–2. Depth, 528 ft; diameter, 6 or 8 in.; water-bearing strata, sandstone in the Lee formation.
Well 8255–3745–3. Depth, 608 ft; diameter, 6 or 8 in.; water-bearing strata, sandstone in the Lee formation; static water level, 283 ft below ground; yield, 45 gpm.
Well 8255–3745–4. Depth, 510 ft; diameter, 6 or 8 in.; water-bearing strata, sandstone in the Lee formation.
Well 8255–3745–5. Depth, 627 ft; diameter, 6 or 8 in.; water-bearing strata, sandstone in the Lee formation.
Treatment: Aeration over coke; the addition of caustic soda and copper sulfate; chlorination; filtration.
Storage: Raw water, 170,000 gal in an impounding reservoir; finished water, 370,000 gal in two open pits, two steel settling tanks, and two wooden storage tanks.
Total distribution of water for 1951: 12,300,000 gal.
Average daily pumpage: 34,000 gal.
Remarks: The water is used for the secondary recovery of petroleum. Water is pumped from the wells to the raw water storage reservoir, flows from the reservoir through the treatment plant to the finished water storage tanks, and is pumped from the finished water storage tanks to the distribution system. The wells are pumped as needed.

Analysis, in parts per million, well 8255–3745–4

(Collected Oct. 21, 1953)

Silica (SiO_2)	11
Iron (Fe)	.70
Manganese (Mn)	.00
Calcium (Ca)	12
Magnesium (Mg)	4.1
Sodium (Na)	183
Potassium (K)	1.2
Bicarbonate (HCO_3)	354
Sulfate (SO_4)	.9
Chloride (Cl)	100
Fluoride (F)	.4
Nitrate (NO_3)	1.2
Dissolved solids	490
Hardness as $CaCO_3$	
Total	47
Noncarbonate	0
Temperature (°F)	59
pH	7.4
Specific conductance at 25° C (micromhos)	863

Salyersville

Population served: 1,174.
Ownership: Municipal.
Source: Two wells.
Well 8300–3745–1, at the treatment plant. Depth, 660 ft; diameter, 8 in.; date drilled, 1934; water-bearing strata, sandstone in the Lee formation; static water level, 140 ft below ground, June 10, 1948; yield, 150 gpm; specific capacity, 1.06 gpm per foot after 4 hr pumping at 125 gpm.
Well 8300–3745–2, 175 ft south of the treatment plant. Depth, 487 ft; diameter, 10 in.; water-bearing strata, sandstone in the Lee formation; static water level, 8.9 ft below ground, June 4, 1948.
Treatment: Aeration; filtration; chlorination.
Capacity of treatment plant: 45,000 gpd.
Storage: 133,000 gal in the clear well and a tank on a hillside north of Salyersville.
Total distribution of water for 1950: 10,173,000 gal.
Maximum monthly (December).... 1,129,000 gal
Minimum monthly (January)..... 795,000 gal
Average daily pumpage: 28,000 gal.
Remarks: Water is pumped from the wells to the treatment plant, flows through the plant to the clear well, is pumped from the well to the storage tank, and flows from the tank to the distribution system. Well 8300–3745–1 is pumped 4 hr daily, and well 8300–3745–2 is pumped 2 hr daily.

Average daily pumpage in gallons, by months, 1950

January	26,000	July	32,000
February	31,000	August	32,000
March	30,000	September	34,000
April	33,000	October	31,000
May	30,000	November	33,000
June	29,000	December	36,000

Analysis, in parts per million, well 8300–3745–1

(Collected Oct. 15, 1951)

Silica (SiO_2)	8.2
Iron (Fe)	.20
Manganese (Mn)	.00
Calcium (Ca)	4.8
Magnesium (Mg)	2.9
Sodium (Na)	230
Potassium (K)	6.8
Bicarbonate (HCO_3)	370
Sulfate (SO_4)	.8
Chloride (Cl)	160
Fluoride (F)	.2
Nitrate (NO_3)	.0
Dissolved solids	582
Hardness as $CaCO_3$	
Total	24
Noncarbonate	0
pH	7.7
Specific conductance at 25° C (micromhos)	1,030

Analysis, in parts per million, well 8300–3745–2

(Collected Oct. 15, 1951)

Silica (SiO_2)	17
Iron (Fe)	1.0
Manganese (Mn)	.00
Calcium (Ca)	17
Magnesium (Mg)	5.8
Sodium (Na)	161
Potassium (K)	6.6
Bicarbonate (HCO_3)	278
Sulfate (SO_4)	2.0
Chloride (Cl)	130
Fluoride (F)	.2

Analysis, in parts per million, well 8300–3745–2—Con.

Nitrate (NO_3)	1.6
Dissolved solids	465
Hardness as $CaCO_3$	
Total	66
Noncarbonate	0
pH	7.5
Specific conductance at 25° C (micromhos)	811

Wheelersburg, Brundred Oil Corp.

Ownership: Brundred Oil Corp.
Source: One well, 1.7 miles south of the Wheelersburg Post Office.
Well 8300–3745–3. Depth, 440 ft; diameter, $8\frac{1}{4}$ in.; date drilled, 1950; water-bearing strata, sandstone in the Lee formation; static water level, 173 ft below ground; yield, 30 gpm; specific capacity, 0.65 gpm per foot after several hours pumping.
Treatment: The addition of caustic soda and Calgon; chlorination; filtration.
Storage: Raw water, 4,000 gal in a tank on hillside.
Total distribution of water June 8, 1951–May 31, 1952: 5,560,000 gal.
Average daily pumpage: 16,000 gal.
Remarks: The water is used for the secondary recovery of petroleum. Water is pumped from the well to the filter, and is pumped from the filter to the distribution system.

Analysis, in parts per million, well 8300–3745–3

(Collected July 30, 1952)

Silica (SiO_2)	16
Iron (Fe)	1.0
Manganese (Mn)	.00
Calcium (Ca)	30
Magnesium (Mg)	9.2
Sodium (Na)	8.2
Potassium (K)	1.3
Bicarbonate (HCO_3)	161
Sulfate (SO_4)	2.1
Chloride (Cl)	1.8
Fluoride (F)	.1
Nitrate (NO_3)	.1
Dissolved solids	143
Hardness as $CaCO_3$	
Total	114
Noncarbonate	0
Temperature (° F)	58
pH	6.9
Specific conductance at 25° C (micromhos)	258

MARTIN COUNTY

Tomahawk, Kentucky-West Virginia Gas Co.

Ownership: Kentucky-West Virginia Gas Co.
Source: Rockhouse Fork of Rockcastle Creek, 8235–3750–A, south of State Route 40 at Tomahawk.
Treatment: None.
Storage: 21,000 gal.
Total distribution of water for average year: 54,360,000 gal.
Average daily pumpage, when in operation: 360,000 gal.
Remarks: The water is used for cooling compressor engines. The station is in operation for about 151 days during each winter. The water flows from the creek to a "well" 30 ft deep and 10 ft in diameter inside of which is a drilled well 147 ft deep. The water is pumped by airlift from the 147-ft well into an elevated storage tank and flows from the tank through the cooling system and is returned to the creek.

Warfield, Columbia Gas System of United Fuel Co.

Ownership: Columbia Gas System of United Fuel Co.
Source: Tug Fork of the Big Sandy River, 8220–3750–A, 0.1 mile southeast of the toll bridge on State Route 40.
Treatment: Coagulation with alum and lime; softening with zeolites; filtration; commercial boiler-water treatment.
Storage: Raw water, 200,000 gal; finished water, 82,000 gal.
Total distribution of water for average year: 36,865,000 gal.
Average daily pumpage: 101,000 gal.
Remarks: Most of the water is used for cooling. The water is pumped from the river to the settling tanks, and is pumped from the tanks through the filters to an elevated tank; the boiler water flows from the elevated tank through the softeners to the boilers; the cooling water flows from the elevated tank to the makeup pit and cooling system.

McCREARY COUNTY

Stearns

Population served: 1,210.
Ownership: Stearns Coal and Lumber Co., Inc.
Source: Four ponds. Bridge Fork Pond, 8425–3640–A, $1\frac{1}{2}$ miles north of the powerplant; Mill Pond, 8425–3640–B, on east side of the Stearns Power Plant; Hatfield Pond, 8425–3650–C, 500 yards east of the powerplant (standby supplies); and Appletree Pond, 8425–3640–D, 500 yards southeast of the powerplant.
Treatment: Chlorination (city water).
Storage: Raw water, 100,000 gal in the Southern Railway tank, 40,000 gal in two Kentucky & Tennessee Railway tanks, and 50,000 gal in tank by the hotel (for fire only); finished water, 50,000 gal in a tank on a hill, 1,000 yards north of the powerplant.
Total distribution of water for 1951: 56,738,000 gal.
Average daily pumpage, 1951: 16,000 gal.
Remarks: Water is pumped from either Bridge Fork Pond or Appletree Pond to the Stearns Power Plant and the three railway tanks. Part of the condensate from the powerplant is pumped to the storage tank north of the plant to supply water for the city. The water flows through the distribution system by gravity. Water from Mill Pond (connected with Hatfield Pond) is used for cooling in the powerplant and recirculated at the rate of 5,000 gpm. As the chief effect of this recirculation is to raise the temperature of the water, the amount of water used is not included in the total distribution or average daily pumpage of water.

MENIFEE COUNTY

Frenchburg

Population served: 480.
Ownership: Frenchburg Schools and Jane Cook Hospital.
Source: Two wells.
Well 8335–3755–3, 50 ft west of Jane Cook Hospital. Depth, 35 or 45 ft; diameter, 6 in.; water-bearing strata, shale of Mississippian age.
Well 8335–3755–4, 40 ft east of Jane Cook Hospital. Depth, 35 or 45 ft; diameter, 6 in.; water-bearing strata, shale of Mississippian age; static water level, about 10 ft below ground, April 1, 1953.
Treatment: Chlorination; softening for part of supply.
Storage: 1,500 gal in tank on hillside west of the hospital.
Total distribution of water for average year: 2,690,000 gal.
Average daily pumpage: 11,000 gal.
Remarks: Water is pumped from the wells to the storage tank and flows from the tank to the distribution system. The two wells must be pumped together to lift the water to the storage tank. The water is chlorinated as it is pumped from well 8335–3755–4 and is mixed with water from well 8335–3755–3 in the line.

MORGAN COUNTY

West Liberty

Population served: 970.
Ownership: Municipal.
Source: Licking River near crossing of U. S. 460.
Treatment: Coagulation with alum and lime; filtration; chlorination.
Capacity of treatment plant: 288,000 gpd.
Storage: 90,000 gal in steel tank on hillside north of West Liberty.
Total distribution of water for 1950: 21,600,000 gal.
Breakdown of annual distribution as to use:

Domestic	19,700,000 gal
Industrial and commercial	1,176,000 gal
Other public uses	340,000 gal
Leakage and waste	360,000 gal

Average daily pumpage, 1950: 60,000 gal.

PERRY COUNTY

Barridge

Population served: 180.
Ownership: Columbus Mining Co.
Source: One mine, at Barridge.
Mine 8300–3710–3. Water-bearing strata, coal (No. 4 seam) in the Breathitt formation.
Treatment: None.

Blue Diamond

Population served: 2,336.
Ownership: Blue Diamond Coal Co.
Source: One mine, 8310–3715–2, about 0.8 mile north of the company store (bathhouse supply); another section of the same mine, 8310–3715–3, near State Route 267, about half a mile north of Blue Diamond (domestic supply).
Mine 8310–3715–2, 3. Water-bearing strata, coal (No. 7 seam) in the Breathitt formation.
Treatment: None.
Storage: 60,500 gal in three tanks on a hillside north of Blue Diamond.
Total distribution of water for average year: 26,950,000 gal.
Breakdown of annual distribution as to use:

Domestic	20,800,000 gal
Industrial	6,150,000 gal

Average daily pumpage: 81,000 gal.
Remarks: Most of the water is used for domestic purposes but some is used for dust control at the coal preparation plant. The bathhouse supply flows from the mine to the storage tank, and flows from the tank to the bathhouse. The household supply flows from the mine to the distribution system.

Analysis, in parts per million, mine 8310–3715–3

(Collected Feb. 25, 1953)

Silica (SiO_2)	7.1
Iron (Fe)	.45
Manganese (Mn)	.37
Calcium (Ca)	70
Magnesium (Mg)	39
Sodium (Na)	8.7
Potassium (K)	7.2
Bicarbonate (HCO_3)	219
Sulfate (SO_4)	157
Chloride (Cl)	5.5
Fluoride (F)	.2
Nitrate (NO_3)	1.0
Dissolved solids	410
Hardness as $CaCO_3$	
Total	336
Noncarbonate	156
Temperature (°F)	53
pH	7.5
Specific conductance at 25°C (micromhos)	619

Cornettsville, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: North Fork of the Kentucky River, 8305–3705–A, near Kentucky Highway 7, half a mile southwest of the Cornettsville Post Office.
Treatment: Commercial boiler-water treatment.
Storage: Raw water, 100,000 gal; finished water, 120,000 gal.
Total distribution of water for average year: 62,050,000 gal.
Average daily pumpage: 170,000 gal.
Remarks: The water is used for generating steam in locomotives. The water is pumped from the river to the raw water storage tank, flows from this tank to the finished water storage tank, and is treated as it flows from raw water storage tank to the finished water storage tank.

Daisy

Population served: 220.
Ownership: W. M. Ritter Lumber Co.

Source: Four wells (domestic supply), two wells and Big Leatherwood Creek, 8305–3705–A (industrial supply).
Treatment: Commercial boiler-water treatment (boiler water).
Storage: Raw water, 125,000 gal in three wooden tanks.

Fourseam

Population served: 362.
Ownership: Fourseam Coal Co.
Source: Two mines, near Fourseam.
Mine 8310–3710–1 (industrial supply). Water-bearing strata, coal (No. 4 seam) in the Breathitt formation.
Mine 8310–3710–2 (public supply). Water-bearing strata, coal (No. 4 seam) in the Breathitt formation.
Treatment: None.
Storage: 5,000 gal in two concrete reservoirs.

Glomawr

Population served: 360.
Ownership: Ellen Coal Co.
Source: One mine, near Glomawr; one well (industrial supply).
Mine 8305–3710–1. Water-bearing strata, coal (No. 7 or Flag seam) in the Breathitt formation.
Well 8305–3710–2. Depth, 125 ft; diameter, 4(?) in.; water-bearing strata, Breathitt formation; yield, 4 gpm.
Treatment: Settlement (well water).

Hardburly

Population served: 630.
Ownership: Old King Mining Co.
Source: Impounding reservoir (domestic supply); one mine, near Hardburly.
Mine, 8305–3715–1. Water-bearing strata, coal (No. 7 seam) in the Breathitt formation.
Treatment: The addition of blue vitriol, occasional chlorination (pond water).

Harveyton

Population served: 560.
Ownership: Harvey Coal Co.
Source: Two wells; one mine, about half a mile east of the company store.
Well 8310–3715–4, on bank of First Creek at mouth of Andy Camp Branch. Depth, 120 ft; water-bearing strata, sandstone and shale in the Breathitt formation; yield, 1.8 gpm.
Well 8310–3715–5, on Andy Camp Branch a few hundred feet northwest of well 8310–3715–4. Depth, 136 ft; water-bearing strata, Breathitt formation; yield, 2.3 gpm.
Mine 8310–3715–6. Water-bearing strata, coal (No. 6 seam) in the Breathitt formation.
Treatment: None.
Storage: 10,000 gal in tank on hillside.
Total distribution of water for average year: 9,900,000 gal.
From mine ..... 9,600,000 gal
From wells ..... 300,000 gal
Breakdown of annual distribution as to use:
Domestic ..... 2,400,000 gal
Industrial ..... 7,500,000 gal
Average daily pumpage, when in operation: 37,000 gal.
From mine ..... 36,000 gal
From wells ..... 1,000 gal
Remarks: Water from the wells is used for domestic purposes and the water from the mine is used partly for washing coal and partly for domestic purposes. The water from the wells is pumped to the storage tank, and flows from the tank to the distribution system. The water from the mine flows from the mine to the distribution system.

Analysis, in parts per million, wells 8310–3715–4 and 5

(Collected Feb. 25, 1953)

Silica (SiO_2)	14
Iron (Fe)	.36
Manganese (Mn)	.00
Calcium (Ca)	64
Magnesium (Mg)	17
Sodium (Na)	23
Potassium (K)	2.6
Bicarbonate (HCO_3)	210
Sulfate (SO_4)	86
Chloride (Cl)	13
Fluoride (F)	.1
Nitrate (NO_3)	2.5
Dissolved solids	334
Hardness as $CaCO_3$	
Total	230
Noncarbonate	58
Temperature (°F)	46
pH	7.0
Specific conductance at 25°C (micromhos)	511

Analysis, in parts per million, mine 8310–3715–6

(Collected Feb. 25, 1953)

Silica (SiO_2)	6.2
Iron (Fe)	2.2
Manganese (Mn)	.18
Calcium (Ca)	78
Magnesium (Mg)	28
Sodium (Na)	28
Potassium (K)	10
Bicarbonate (HCO_3)	248
Sulfate (SO_4)	178
Chloride (Cl)	3.1
Fluoride (F)	.1
Nitrate (NO_3)	1.5
Dissolved solids	468
Hardness as $CaCO_3$	
Total	312
Noncarbonate	107
Temperature (°F)	53
pH	6.6
Specific conductance at 25°C (micromhos)	688

Hazard

Population served: 6,985; Lothair, 2,500; Allais, 315; total, 9,800.
Ownership: Municipal.
Source: North Fork of the Kentucky River near State

Source—Continued
Route 15 in southeast Hazard.
Treatment: Prechlorination; coagulation with alum and lime; the addition of ammonia; rapid sand filtration; postchlorination.
Storage: 2,135,000 gal in two steel tanks on a hillside north of Hazard.
Total distribution of water for 1951: 321,779,000 gal.
Maximum monthly (July)..... 31,038,000 gal
Minimum monthly (April)..... 23,289,000 gal
Average daily pumpage, 1951: 882,000 gal.
Remarks: Water is pumped from the river to the treatment plant, flows through the plant to the clear well, is pumped from the well to the storage tanks and flows from the tanks to the distribution system.

Regular determinations at treatment plant, 1951

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
pH	.....	.....	.....	7.4	8.4	6.8
Temperature (° F).	61.8	87.8	32	.....	.....	.....

Average daily pumpage in gallons, by months, 1951

January	932,000	July	1,001,000
February	916,000	August	980,000
March	785,000	September	828,000
April	776,000	October	835,000
May	855,000	November	895,000
June	879,000	December	904,000

Hazard, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: North Fork of the Kentucky River, 8310–3715–A, about a fourth of a mile north of the railroad depot in Hazard.
Treatment: Commercial boiler-water treatment.
Storage: Raw water, 100,000 gal; finished water 100,000 gal.
Total distribution of water for average year: 36,500,000 gal.
Average daily pumpage: 100,000 gal.
Remarks: The water is used for generating steam in locomotives. The water is pumped from the river to the settling tank and flows from the settling tank to the finished water storage tank.

Kodak

Population served: 320.
Ownership: Meems-Haskins Coal Co.
Source: Two wells.
Well 8300–3710–1, 0.2 mile southeast of the Kodak Post Office. Depth, 85 ft; date drilled, 1950; water-bearing strata, sandstone in the Breathitt formation.
Well 8300–3710–2, 0.8 mile southeast of the Kodak Post Office. Depth, 100 or 600 ft; date drilled, 1950; water-bearing strata, Breathitt formation.
Treatment: None.
Storage: 50-gal pressure tank.
Total distribution of water for average year: 1,752,000 gal.
Average daily pumpage: 5,000 gal.

Leatherwood

Population served: 2,150.
Ownership: Blue Diamond Coal Co.
Source: Eight wells (public supply); Guthrie Branch of Cutshin Creek impounded, 8310–3700–A, near Kentucky Highway 699 (formerly 448) in Leslie County about 2 miles southwest of Leatherwood (industrial supply); Clover Fork of Leatherwood Creek, 8305–3700–A, near State Route 699 about 1½ miles northeast of Leatherwood (industrial standby).
Well 8310–3700–2, near house no. 11 in Leatherwood. Depth, 308 ft; diameter, 5 in.; water-bearing strata, Breathitt formation.
Well 8310–3700–3, at supply house in Leatherwood. Depth, 208 ft; diameter, 5 in.; water-bearing strata, Breathitt formation.
Well 8310–3700–6, near bathhouse at Leatherwood. Depth, 135 ft; diameter, 5 in.; water-bearing strata, Breathitt formation.
Well 8310–3700–8, near schoolhouse in Leatherwood. Depth, 267 ft; diameter, 5 in.; water-bearing strata, Breathitt formation.
Well 8310–3700–9, on State Route 699 (formerly 448) in Leslie County, about 1 mile southwest of the Leatherwood Post Office. Depth, 404 ft; diameter, 8 in.; water-bearing strata, Breathitt formation.
Well 8310–3700–10, on State Route 699 (formerly 448) about 1.1 miles southwest of the Leatherwood Post Office (standby). Depth, 238 ft; diameter, 8 in.; water-bearing strata, Breathitt formation.
Well 8310–3700–11, on State Route 699 (formerly 448) in Leslie County, about 1.2 miles southwest of the Leatherwood Post Office (standby). Depth, 316 ft; diameter, 8 in.; water-bearing strata, Breathitt formation.
Well 8310–3700–12, on Left Fork of Lick Fork at Leatherwood. Depth, 250 ft; diameter, 8 in.; water-bearing strata, Breathitt formation.
Treatment: Chlorination (water from wells 8310–3700–3, 8, and 12); aeration over coke (water from wells 8310–3700–8, 9, and 12); the occasional addition of lime to the mine water.
Storage: Raw water, 29,210,000 gal in mine, impounded reservoir at Guthrie Branch, and two steel tanks and two concrete tanks; finished water, 40,000 gal in two steel tanks and one concrete tank.
Total distribution of water for average year: 86,300,000 gal.
From stream..... 72,000,000 gal
From wells..... 14,300,000 gal
Breakdown of annual distribution as to use:
Domestic..... 13,570,000 gal
Industrial and commercial..... 72,730,000 gal
Average daily pumpage: 327,000 gal.
From stream..... 288,000 gal
From wells..... 39,000 gal
Remarks: The well water is used for domestic purposes and the surface water is used for washing coal. The water from the wells is pumped to seven storage tanks in the camp, and flows from the tanks to the distribution system. Water from the impounding reservoir is pumped into the mine when needed, is pumped from the mine to the storage tank at the coal-washing plant, flows from the storage tank to the coal washer and is discharged into a nearby stream. A plan is under consideration to abandon the wells and treat the water stored in the mine for domestic use.

Analysis, in parts per million, well 8310–3700–3

(Collected Feb. 26, 1953)

Silica (SiO_2)	10
Iron (Fe)	4.6
Manganese (Mn)	.00
Calcium (Ca)	35
Magnesium (Mg)	12
Sodium (Na)	61
Potassium (K)	3.0
Bicarbonate (HCO_3)	180
Sulfate (SO_4)	17
Chloride (Cl)	76
Fluoride (F)	.1
Nitrate (NO_3)	2.7
Dissolved solids	294
Hardness as $CaCO_3$	
Total	139
Noncarbonate	0
Temperature (° F)	59
pH	7.3
Specific conductance at 25° C (micromhos)	554

Analysis, in parts per million, well 8310–3700–9

(Collected Feb. 26, 1953)

Silica (SiO_2)	4.1
Aluminum (Al)	.0
Iron (Fe)	.25
Manganese (Mn)	.00
Chromium (Cr)	.00
Copper (Cu)	.0
Calcium (Ca)	1.4
Magnesium (Mg)	.9
Sodium (Na)	.6
Potassium (K)	1.0
Bicarbonate (HCO_3)	5
Sulfate (SO_4)	5.0
Chloride (Cl)	1.2
Fluoride (F)	.1
Nitrate (NO_3)	.4
Dissolved solids	20
Hardness as $CaCO_3$	
Total	7
Noncarbonate	3
Temperature (° F)	47
pH	6.3
Specific conductance at 25° C (micromhos)	21.7

Lothair, Kentucky-West Virginia Power Co.

Ownership: Kentucky-West Virginia Power Co.
Source: North Fork of the Kentucky River, 8310–3710–A, near State Route 15, at Lothair.
Treatment: The addition of soda ash, lime, sodium aluminate; filtration (boiler water).
Remarks: Most of the water is used for generating and condensing steam. The boiler makeup water is pumped from the river through the treatment plant, is pumped to the storage tanks, and flows from the tanks to the boilers. The cooling water is pumped from the river directly to the condensers and flows back to the river. During hot summer months some of the cooling water is recirculated through a spray pond.

Marlowe (Post Office Scuddy)

Population served: 220.
Ownership: Marlowe Coal Co.
Source: One well, about 0.4 mile west of the Scuddy Post Office.
Well 8305–3710–3. Depth, 169 ft; date drilled, April 1951; water-bearing strata, Breathitt formation; static water level, 100 ft below ground.
Treatment: None.
Total distribution of water for average year: 1,460,000 gal.
Average daily pumpage: 4,000 gal.

Slemp

Population served: 10.
Ownership: Louisville & Nashville Railroad Co.
Source: One well, near State Route 699 (formerly 448), 6.2 miles southwest of State Route 7 at Cornettsville.
Well 8305–3700–1. Depth, 70 ft; diameter, 6 in.; date drilled, 1946; water-bearing formation, sandstone in the Breathitt formation; static water level, 18 ft below ground; yield, 100 gpm.
Treatment: Commercial boiler-water treatment; the water is treated as it flows from the storage tank.
Storage: Raw water, 20,000 gal.
Total distribution of water for average year: 5,000,000 gal.
Average daily pumpage: 20,000 gal.
Remarks: Most of the water is used for generating steam in locomotives. The water is pumped from the well to the storage tank, and flows from the tank to the locomotives.

Analysis, in parts per million, well 8305–3700–1

(Collected Oct. 20, 1953)

Silica (SiO_2)	17
Iron (Fe)	.73
Manganese (Mn)	.00
Calcium (Ca)	35
Magnesium (Mg)	20
Sodium (Na)	104
Potassium (K)	2.3
Bicarbonate (HCO_3)	180
Sulfate (SO_4)	.7
Chloride (Cl)	178
Fluoride (F)	.1
Nitrate (NO_3)	2.0
Dissolved solids	456
Hardness as $CaCO_3$	
Total	171
Noncarbonate	22
Temperature (° F)	62
pH	7.2
Specific conductance at 25° C (micromhos)	855

PIKE COUNTY

Alleghany (Post Office Hellier)

Population served: 40.
Ownership: Hellier Coal and Coke Co., and Kentucky Fuel Co.

Source: Four wells; one mine near Alleghany.
Well 8225–3715–1, in boiler house, 1.7 miles southwest of the Hellier Post Office (domestic supply). Depth, 100 ft; water-bearing strata, Breathitt formation; static water level, 60+ ft below ground, January 1953.
Well 8225–3715–2, at tipple, 1.1 miles southwest of the Hellier Post Office (industrial supply). Depth, 700 ft; water-bearing strata, Breathitt formation; diameter, 8(?) in.; yield, 70 gpm.
Well 8225–3715–3, at clubhouse, 0.7 mile southwest of the Hellier Post Office (domestic supply); water-bearing strata, Breathitt formation.
Well 8225–3715–4, at dwelling, 0.7 mile southwest of the Hellier Post Office (domestic supply); water-bearing strata, Breathitt formation.
Mine 8225–3715–7. Water-bearing strata, coal in the Breathitt formation.
Treatment: None.
Storage: Raw water, 10,000 gal in steel tank.
Total distribution of water for average year: 45,730,000 gal.
From mine..... 28,200,000 gal
From wells..... 17,530,000 gal
Breakdown of annual distribution as to use:
Domestic..... 365,000 gal
Industrial and commercial..... 45,365,000 gal
Average daily pumpage, when in operation: 182,000 gal.
From mine..... 112,500 gal
From wells..... 69,200 gal
Remarks: The water from well 8225–3715–2 is used for washing coal. The water is pumped from the well to a storage tank and flows from the tank to the coal-washing plant. Most of the mine water is used for quenching coke. The water is pumped from the mine into Marrowbone Creek and flows into a collecting sump in the creek bed. The water is pumped from the collecting sump in the creek bed to another collecting sump at the "water station" and is pumped from the "water station" to the coke ovens and to another part of the abandoned mine for storage. Most of the water pumped from the collecting sump in the creek bed is ground water pumped into the creek from the coal mine, but some is surface water from the creek.

Boldman

Population served: 30.
Ownership: Atlantic Seaboard Corp.
Source: Levisa Fork of the Big Sandy River, 8235–3730–A, near U. S. 23 at Boldman.
Treatment: Settlement with caustic soda and phosphate (boiler water); filtration; chlorination (domestic supply).
Storage: Raw water, 235,000 gal in an elevated steel tank and settling basin; finished water, 1,000 gal in an elevated steel tank.
Total distribution of water for average year: 3,160,548,000 gal.
Breakdown of annual distribution as to use:
Domestic..... 580,000 gal
Industrial..... 3,160,000,000 gal
Average daily pumpage: 8,642,000 gal.
Remarks: Most of the water is used for cooling, but some is used for generating steam and domestic purposes. The water is pumped from the river through the cooling system and a small amount recirculated through a cooling tower. The boiler water is pumped from the river to the cooling line, is taken off the cooling line and flows to the settling tank, is pumped from the settling tank to an elevated storage tank, and flows from the storage tank to the boilers. The domestic supply flows from the boiler storage tank to the filters, is chlorinated, is pumped from the filters to an elevated tank, and flows from the tank to the distribution system.

Elkhorn City

Population served: 1,349.
Ownership: Municipal.
Source: Russell Fork of the Big Sandy River near State Route 80 at west end of highway bridge.
Treatment: Chlorination.
Storage: 30,000 gal in tank on hillside west of intake.
Total distribution of water for average year: 21,900,000 gal.
Average daily pumpage: 60,000 gal.
Remarks: The water is pumped from the river to the storage tank, and flows from the tank to the distribution system. Plans for a new treatment plant and distribution system are under consideration.

Esco

Population served: 20.
Ownership: Utilities Elkhorn Coal Co.
Source: Three wells, near Shelby Creek, about 2½ miles south of the Robinson Creek Post Office.
Well 8230–3720–1. Depth, 150 ft; diameter, 6 in.; date drilled, 1941; water-bearing strata, Breathitt formation; static water level, 20 ft below ground; yield, 60+ gpm.
Well 8230–3720–2. Depth, 120 ft; water-bearing strata, Breathitt formation; static water level, 80 to 90 ft below ground.
Well 8230–3720–3. Depth, 80 ft; water-bearing strata, Breathitt formation; static water level, 45 to 50 ft below ground.
Treatment: None.
Storage: Raw water, 60,000 gal in wooden tank on hillside west of Esco.
Total distribution of water for average year: 15,183,000 gal.
Breakdown of annual distribution as to use:
Domestic..... 183,000 gal
Industrial..... 15,000,000 gal
Average daily pumpage, when in operation: 61,000 gal.
Remarks: Most of the water is used for washing coal. The water from well 8230–3720–1 is pumped from the well to the storage tank and flows from the tank to the coal-washing plant.

Analysis, in parts per million, well 8230–3720–1

(Collected Jan. 19, 1953)

Silica (SiO_2)	14
Iron (Fe)	18
Manganese (Mn)	1.9
Calcium (Ca)	67
Magnesium (Mg)	29
Sodium (Na)	39
Potassium (K)	3.8
Bicarbonate (HCO_3)	102

Analysis, in parts per million, well 8230–3720–1—Con.

Sulfate (SO_4)	225
Chloride (Cl)	44
Fluoride (F)	.1
Nitrate (NO_3)	.1
Dissolved solids	488
Hardness as $CaCO_3$	
Total	286
Noncarbonate	203
Temperature (° F)	59
pH	6.2
Specific conductance at 25° C (micromhos)	735

Freeburn

Population served: 500.
Ownership: Freeburn Water Co. (privately owned).
Source: Peter Creek.
Treatment: Filtration; chlorination.
Total distribution of water for average year: 4,125,000 gal.
Average daily pumpage: 11,000 gal.

Henry Clay

Population served: 250; Lookout, 160; total, 410.
Ownership: Semet-Solvay Division of Allied Chemical & Dye Corp.
Source: One well, about 1 mile southwest of the Lookout Post Office.
Well 8225–3715–5. Depth, 242 ft; diameter, 6 in.; water-bearing strata, Breathitt formation; static water level, 209 ft below ground; yield, 28 gpm.
Treatment: Chlorination.
Storage: 50,000 gal in one wooden tank.
Total distribution of water for average year: 2,263,000 gal.
Average daily pumpage: 6,000 gal.

Majestic

Population served: 550.
Ownership: Majestic Collieries Co.
Source: Five wells; one spring, about 1 mile northwest of the Majestic Post Office (domestic supply); one mine, about 1 mile northwest of the Majestic Post Office (industrial supply).
Spring 8205–3730–1. Water-bearing strata, alluvium of Quaternary age(?); yield, 3 gpm (estimated).
Well 8205–3730–2, at house No. 166 in Majestic. Depth, 71 ft; diameter, 6 in.; water-bearing strata, Breathitt formation; date drilled, 1947(?); static water level, 13.39 ft below ground, January 14, 1953.
Well 8205–3730–3, at house No. 148 in Majestic. Depth, 56 ft; diameter, 6 in.; water-bearing strata, Breathitt formation; static water level, 23.55 ft below ground, January 14, 1953.
Well 8205–3730–4, at house No. 116 in Majestic. Depth, 67 ft; diameter, 6 in.; water-bearing strata, Breathitt formation; static water level, 25.81 ft below ground, January 14, 1953.
Well 8205–3730–5, at supply house, 0.2 mile west of the Majestic Post Office. Depth, 280 ft; diameter, 8 in.; water-bearing strata, Breathitt formation; date drilled, 1947; static water level, 60 ft below ground; yield, 5 gpm.
Mine 8205–3730–6. Water-bearing strata, coal (Pond Creek seam) in the Breathitt formation.
Well 8205–3730–7, at east side of the Majestic Post Office. Depth, 107 ft; water-bearing strata, Breathitt formation.
Treatment: Chlorination (water from wells 8205–3730–5 and 7).
Storage: Raw water, 110,000 gal in two tanks.
Total distribution of water for average year: 11,697,000 gal.
From mine 7,500,000 gal
From wells 4,197,000 gal
Breakdown of annual distribution as to use:
Domestic 4,197,000 gal
Industrial 7,500,000 gal
Average daily pumpage: 42,000 gal.
From mine 30,000 gal
From wells 12,000 gal
Remarks: Water from the mine is used for washing coal, and the water from wells and spring for domestic purposes. The water from the coal mine is pumped from the mine to a 90,000-gal storage tank and flows from the tank to the coal-washing plant. The water from wells 8205–3730–5 and 7 is pumped from the wells to a 20,000-gal storage tank and flows to the distribution system. The water from spring 8205–3730–1 flows to several dwellings. The water from wells 8205–3730–2, 3, and 4 is pumped from the wells by hand pumps.

Analysis, in parts per million, well 8205–3730–5

(Collected Jan. 14, 1953)

Silica (SiO_2)	7.5
Iron (Fe)	6.6
Manganese (Mn)	.05
Calcium (Ca)	30
Magnesium (Mg)	8.0
Sodium (Na)	29
Potassium (K)	1.8
Bicarbonate (HCO_3)	135
Sulfate (SO_4)	52
Chloride (Cl)	8.5
Fluoride (F)	.1
Nitrate (NO_3)	1.4
Dissolved solids	212
Hardness as $CaCO_3$	
Total	107
Noncarbonate	0
Temperature (° F)	57
pH	6.9
Specific conductance at 25° C (micromhos)	343

Analysis, in parts per million, mine 8205–3730–6

(Collected Jan. 15, 1953)

Silica (SiO_2)	8.5
Iron (Fe)[1]	.29
Manganese (Mn)[1]	.38
Calcium (Ca)	79
Magnesium (Mg)	40
Sodium (Na)	8.2
Potassium (K)	3.8
Bicarbonate (HCO_3)	107
Sulfate (SO_4)	280
Chloride (Cl)	2.0

[1]In solution and sediment.

Analysis, in parts per million, mine 8205–3730–6—Con.

Fluoride (F)	0.2
Nitrate (NO_3)	1.2
Dissolved solids	504
Hardness as $CaCO_3$	
Total	362
Noncarbonate	274
Temperature (° F)	43
pH	7.4
Specific conductance at 25° C (micromhos)	700

Octavia (Post Office McAndrews)

Population served: 200.
Ownership: Fairfax Coal Co.
Source: One well, 1.8 miles southwest of the McAndrews Post Office.
Well 8215–3730–10. Depth, 183 ft; diameter, 8 in.; water-bearing strata, Breathitt formation; static water level, 20 ft below ground, August 1939; yield, 10 gpm.
Treatment: None.
Storage: 30,000 gal in one wooden tank.
Total distribution of water for average year: 1,825,000 gal.
Average daily pumpage: 5,000 gal.

Pikeville

Population served: 5,450.
Ownership: Municipal.
Source: Levisa Fork of the Big Sandy River near Elm Street in Pikeville.
Treatment: Coagulation with alum and lime; the addition of copper sulfate; filtration; chlorination.
Capacity of treatment plant: 600,000 gpd.
Storage: 675,000 gal in three steel tanks.
Total distribution of water for 1952: 119,484,000 gal.
Maximum monthly (August) 12,321,000 gal
Minimum monthly (December) 8,313,000 gal
Average daily pumpage, 1952: 327,000 gal.
Remarks: The water is pumped from the river to the treatment plant, flows through the plant to the clear well, and is pumped from the well to the distribution system and storage tanks.

Average daily pumpage in gallons, by months, 1952

January	216,000	July	370,000
February	360,000	August	398,000
March	299,000	September	380,000
April	293,000	October	340,000
May	298,000	November	317,000
June	320,000	December	268,000

Pikeville, Pikeville Ice Co.

Ownership: Pikeville Ice Co.
Source: Two wells, 220 Bank Street, Pikeville. Auxiliary supply from city of Pikeville.
Well 8230–3725–1. Depth, 110 ft; diameter, 6 in.; water-bearing strata, Breathitt formation; static water level, 60 ft below ground; yield, 100 gpm.
Well 8230–3725–2 (standby). Depth, 100 to 120 ft; diameter, 6 in.; water-bearing strata, Breathitt formation; static water level, 60 ft below ground; yield, 150 gpm.
Total distribution of water for average year: 12,360,000 gal.
Average daily pumpage: 34,000 gal.
Remarks: The water is used for condensing. The water is pumped from the wells through the condensers and discharged to the river.

Analysis, in parts per million, well 8230–3725–1

(Collected Jan. 16, 1953)

Silica (SiO_2)	18
Iron (Fe)	23
Manganese (Mn)	.64
Calcium (Ca)	27
Magnesium (Mg)	6.1
Sodium (Na)	96
Potassium (K)	2.4
Bicarbonate (HCO_3)	153
Sulfate (SO_4)	7.8
Chloride (Cl)	122
Fluoride (F)	.1
Nitrate (NO_3)	.1
Dissolved solids	354
Hardness as $CaCO_3$	
Total	93
Noncarbonate	0
Temperature (° F)	60
pH	6.2
Specific conductance at 25° C (micromhos)	659

Shelbiana

Population served: 150.
Ownership: Chesapeake & Ohio Railway Co.
Source: Levisa Fork of the Big Sandy River, 8225–3725–A, about half a mile east of the Shelbiana Post Office.
Treatment: The addition of alum, lime, soda ash, and copper sulfate; commercial boiler-water treatment.
Storage: 550,000 gal in two standpipes and one elevated tank.
Total distribution of water for 1951: 59,245,600 gal.
Maximum monthly (November) 5,921,000 gal
Minimum monthly (July) 3,945,000 gal
Average daily pumpage, 1951: 162,000 gal.
Remarks: Most of the water is used for generating steam in locomotives. The water is pumped from the river through the treatment plant to the storage tank at the treatment plant, and flows from the tank at the plant to two other storage tanks and distribution system.

Average daily pumpage in gallons, by months, 1951

January	163,000	July	127,000
February	173,000	August	143,000
March	163,000	September	167,000
April	149,000	October	185,000
May	154,000	November	197,000
June	149,000	December	163,000

Stone

Population served: 300; McVeigh, 60; Pinson Fork and McAndrews, 440; Hardy, 150; total, 950.
Ownership: Eastern Coal Corp.
Source: Five wells; two mines; and Pond Creek, 8215–3730–A, 1.1 miles north of Pinson Fork Post Office.

Source—Continued

Well 8210–3735–1, 0.2 mile northwest of the Hardy Post Office. Depth, 225 ft; diameter, 8 in.; date drilled, 1938; water-bearing strata, shale in the Breathitt formation; static water level, 169 ft below ground, 1938; yield, 21 gpm.

Well 8215–3730–1, at power plant, 0.4 mile south of the Stone Post Office. Depth, 211 ft; diameter, 10 in.; date drilled, 1912; water-bearing strata, shale in the Breathitt formation; static water level, 130 ft below ground; yield, about 50 gpm.

Well 8215–3730–2, at spray pond, 0.4 mile south of the Stone Post Office. Depth, 200 ft; date drilled, 1912; water-bearing strata, Breathitt formation.

Well 8215–3730–3, at McVeigh, 1.7 miles south of the Pinson Fork Post Office. Depth, 50 ft; water-bearing strata, Breathitt formation; static water level, about 3 ft above ground, January 21, 1953; yield, 6 gpm.

Mine 8215–3730–4, 1 mile south of the Pinson Fork Post Office. Water-bearing strata, coal in the Breathitt formation; yield, 150 gpm.

Well 8215–3730–5, at Pinson Fork, 0.3 mile north of the Pinson Fork Post Office. Depth, 240 ft; water-bearing strata, Breathitt formation; yield, 15 gpm.

Mine 8215–3730–6, 0.3 mile north of the Pinson Fork Post Office. Water-bearing strata, coal in the Breathitt formation; yield, 150 gpm.

Treatment: Aeration over coke (well 8215–3730–1); filtration; chlorination; commercial boiler-water treatment (well 8215–3730–1).

Storage: 390,000 gal in six tanks at Stone, McVeigh, Pinson Fork, McAndrews, and Hardy.

Total distribution of water for average year: 156,394,000 gal.

From stream..... 42,000,000 gal
From wells and mines..... 114,394,000 gal

Average daily pumpage: 530,000 gal.

From stream..... 168,000 gal
From wells and mines..... 362,000 gal

Remarks: The water from well 8215–3730–1 is used for boiler water makeup at the power plant and for the domestic supply at Stone. The water from well 8215–3730–2 is used for makeup water at the spray pond. The water from wells 8210–3730–1, 8215–3730–3 and 5, and mines 8215–3730–4 and 6 is used for domestic supplies at Hardy, McVeigh, Pinson Fork, and McAndrews. The water from Pond Creek is used for washing coal.

Analysis, in parts per million, well 8210–3735–1

(Collected Jan. 21, 1953)

Silica (SiO_2)	12
Iron (Fe)	.23
Manganese (Mn)	.00
Calcium (Ca)	5.2
Magnesium (Mg)	1.9
Sodium (Na)	153
Potassium (K)	2.4
Bicarbonate (HCO_3)	240
Sulfate (SO_4)	.6
Chloride (Cl)	112
Fluoride (F)	.4
Nitrate (NO_3)	.1
Dissolved solids	404
Hardness as $CaCO_3$	
Total	21
Noncarbonate	0
Temperature (°F)	59
pH	6.9
Specific conductance at 25°C (micromhos)	725

Analysis, in parts per million, well 8215–3730–1

(Collected Jan. 20, 1953)

Silica (SiO_2)	13
Iron (Fe)	.05
Manganese (Mn)	.27
Calcium (Ca)	42
Magnesium (Mg)	10
Sodium (Na)	84
Potassium (K)	3.7
Bicarbonate (HCO_3)	286
Sulfate (SO_4)	18
Chloride (Cl)	56
Fluoride (F)	.1
Nitrate (NO_3)	2.9
Dissolved solids	384
Hardness as $CaCO_3$	
Total	149
Noncarbonate	0
Temperature (°F)	58
pH	7.3
Specific conductance at 25°C (micromhos)	646

Analysis, in parts per million, well 8215–3730–3

(Collected Jan. 21, 1953)

Silica (SiO_2)	10
Iron (Fe)	.33
Manganese (Mn)	.09
Calcium (Ca)	33
Magnesium (Mg)	9.7
Sodium (Na)	120
Potassium (K)	3.3
Bicarbonate (HCO_3)	378
Sulfate (SO_4)	60
Chloride (Cl)	12
Fluoride (F)	.3
Nitrate (NO_3)	.3
Dissolved solids	424
Hardness as $CaCO_3$	
Total	122
Noncarbonate	0
Temperature (°F)	57
pH	7.2
Specific conductance at 25°C (micromhos)	712

Analysis, in parts per million, mine 8215–3730–4

(Collected Jan. 21, 1953)

Silica (SiO_2)	8.8
Iron (Fe)	.08
Manganese (Mn)	.00
Calcium (Ca)	27
Magnesium (Mg)	11
Sodium (Na)	88
Potassium (K)	4.8
Bicarbonate (HCO_3)	208
Sulfate (SO_4)	120
Chloride (Cl)	6.5

Analysis, in parts per million, mine 8215–3730–4—Con.

(Collected Jan. 21, 1953)

Fluoride (F)	0.2
Nitrate (NO_3)	7.8
Dissolved solids	365
Hardness as $CaCO_3$	
Total	113
Noncarbonate	0
Temperature (° F)	49
pH	7.5
Specific conductance at 25° C (micromhos)	597

ROCKCASTLE COUNTY

Brodhead

Population served: 800.
Ownership: Municipal.
Source: One spring.
Spring 8420–3720–2 (Ramsey Spring), near rural highway about 1½ miles northeast of Brodhead. Water-bearing strata, limestone of Mississippian age.
Treatment: Chlorination. Treatment plant located on a rural highway, 1.4 miles east of Brodhead.
Storage: Raw water, 35,000 gal in a steel tank at spring 8420–3720–2; finished water, 75,000 gal in a steel tank on a hillside northeast of Brodhead.
Total distribution of water for average year: 7,948,000 gal.
Average daily pumpage: 22,000 gal.
Remarks: Water flows from the spring to the raw water storage tank, and flows from the tank through the chlorinator to the distribution system and finished water storage tank. At the time of inventory, spring 8420–3720–2 was insufficient to supply the town and about 8,000 gpd of water was being pumped from a spring-fed branch of Grassy Creek. Plans are under way to develop another spring (Moore Spring) for the main water supply and use spring 8420–3720–2 (Ramsey Spring) as a standby supply.

Analysis, in parts per million, spring 8420–3720–2

(Collected Oct. 23, 1952)

Silica (SiO_2)	8.2
Iron (Fe)	.09
Manganese (Mn)	.00
Calcium (Ca)	44
Magnesium (Mg)	12
Sodium (Na)	3.1
Potassium (K)	.4
Bicarbonate (HCO_3)	189
Sulfate (SO_4)	1.0
Chloride (Cl)	4.5
Fluoride (F)	.0
Nitrate (NO_3)	5.1
Dissolved solids	169
Hardness as $CaCO_3$	
Total	160
Noncarbonate	4
Temperature (° F)	53
pH	7.9
Specific conductance at 25° C (micromhos)	320

Mount Vernon

Population served: 1,300.
Ownership: Municipal.
Source: Headwaters of Little Renfroe Creek, impounded, 1½ miles west of the Mount Vernon Post Office on West Main Street.
Treatment: Coagulation with alum and lime; filtration; chlorination.
Capacity of treatment plant: 180,000 gpd.
Storage: Raw water, 22,500,000 gal in an impounding reservoir; finished water, 115,000 gal in the clear well and one steel and one concrete tank on South Richmond Street.
Total distribution of water for 1951: 19,070,000 gal.
Maximum monthly (October)..... 1,999,000 gal
Minimum monthly (November).. 1,131,000 gal
Average daily pumpage: 52,000 gal.
Remarks: Water flows from the impounding reservoir through the treatment plant to the clear well, and is pumped from the well to the distribution system and storage tanks.

Average daily pumpage in gallons, by months, 1951

January	51,000	July	63,000
February	54,000	August	57,000
March	49,000	September	62,000
April	46,000	October	64,000
May	50,000	November	38,000
June	41,000	December	52,000

WHITLEY COUNTY

Corbin

Population served: 8,460.
Ownership: Municipal.
Source: Laurel River impounded, 2 miles northwest of the junction of U. S. 25E and 25W in the northern part of Corbin.
Treatment: Coagulation with lime and ferric sulfate; chlorination; filtration; the addition of activated carbon. The treatment plant is located on Gordon Hill in Corbin.
Capacity of treatment plant: 4,000,000 gpd.
Storage: Raw water, 400,000,000 gal in the impounding reservoir; finished water, 2,200,000 gal in the clear well and an elevated steel tank on Gordon Hill in Corbin.
Total distribution of water for 1951: 223,783,000 gal.
Maximum monthly (August)..... 21,798,000 gal
Minimum monthly (March)..... 11,675,000 gal
Average daily pumpage, 1951: 613,000 gal.
Remarks: Water is pumped from the impounded stream to the treatment plant, flows through the plant to the clear well, and flows from the well to the distribution system and elevated storage tank.

Average daily pumpage in gallons, by months, 1951

January	605,000	July	699,000
February	649,000	August	702,000
March	376,000	September	622,000
April	595,000	October	608,000
May	627,000	November	614,000
June	642,000	December	616,000

Corbin, Citizens Ice and Fuel Co.

Ownership: Citizens Ice and Fuel Co.
Source: Two wells.
Well 8405–3655–1, at ice plant on State Route 26 (South Main Street) just south of Corbin City limits. Depth, 158 ft; diameter, 10 in.; date drilled, 1929(?); water-bearing strata, sandstone in the Lee formation; static water level, 56 ft below ground, April 1953; yield, 200 gpm.
Well 8405–3655–2, about 40 ft east of well 8405–3655–1 (standby). Depth, 158 ft; diameter, 10 in.; date drilled, 1934; water-bearing strata, sandstone in the Lee formation; static water level, 64½ ft below ground, July 8, 1944.
Treatment: The addition of lime and "distilex"; filtration.
Total distribution of water for average year: 6,300,000 gal.
Average daily pumpage: 17,000 gal.
Remarks: The water is used for making ice and condensing.

Analysis, in parts per million, well 8405–3655–1

(Collected Aug. 6, 1952)

Silica (SiO_2)	18
Iron (Fe)	3.2
Manganese (Mn)	.00
Calcium (Ca)	38
Magnesium (Mg)	12
Sodium (Na)	60
Potassium (K)	3.8
Bicarbonate (HCO_3)	232
Sulfate (SO_4)	58
Chloride (Cl)	20
Fluoride (F)	.0
Nitrate (NO_3)	2.1
Dissolved solids	324
Hardness as $CaCO_3$	
Total	147
Noncarbonate	0
Temperature (°F)	59
pH	7.4
Specific conductance at 25°C (micromhos)	555

Corbin, Louisville & Nashville Railroad Co.

Ownership: Louisville & Nashville Railroad Co.
Source: Laurel River impounded, 8405–3700–A, in Laurel County, 3 miles north of Corbin.
Treatment: Commercial boiler-water treatment. The treatment plant is located north of the depot at Corbin.
Storage: Raw water, 500,000 gal in a concrete storage tank on Gordon Hill in Corbin; finished water, 400,000 gal in standpipes and elevated tanks.
Total distribution of water for average year: 182,500,000 gal.
Average daily pumpage: 500,000 gal.
Remarks: The water is used for generating steam in locomotives. Water is pumped from the impounded stream to the raw water storage tank, flows from this tank through the treatment plant to the standpipes, and flows from the standpipes to the locomotives when needed.

Cumberland Falls State Park

Ownership: Cumberland Falls State Park, Commonwealth of Kentucky.
Source: Cumberland River on State Route 90, about 15 miles south of Corbin.
Treatment: Coagulation with alum and lime; prechlorination (depending on season of year); filtration; postchlorination.
Capacity of treatment plant: 180,000 gpd.
Storage: 150,000 gal in one steel tank near the lodge and one concrete tank on a hillside half a mile east of the gift shop.
Total distribution of water May 1952 - April 1953: 12,456,000 gal.
Maximum monthly (July 1952)..... 1,738,000 gal
Minimum monthly (February 1953)... 356,000 gal
Average daily pumpage, 1952–53: 34,000 gal.
Remarks: Water is pumped from the river to the treatment plant, flows through the plant to the clear well, is pumped from the well to the gift shop, restaurant, and concrete storage tank, is pumped from this tank to the steel storage tank, and flows from the steel storage tank to the distribution system.

Regular determinations at treatment plant, 1952–53

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
pH	7.3	7.6	7.0	8.1	8.6	7.4

Average daily pumpage in gallons, by months, 1952–53

May 1952	37,000	November	25,000
June	50,000	December	13,000
July	56,000	January 1953	14,000
August	53,000	February	13,000
September	47,000	March	15,000
October	37,000	April	33,000

Williamsburg

Population served: 3,355.
Ownership: Municipal.
Source: Cumberland River on U. S. 25W at Williamsburg.
Treatment: Alum; soda ash; chlorination; filtration; the addition of activated carbon when needed.
Capacity of treatment plant: 480,000 gpd.
Storage: 225,000 gal in one steel and one concrete tank at Williamsburg.
Total distribution of water for 1951: 60,465,000 gal.
Maximum monthly (July)..... 5,555,000 gal
Minimum monthly (November)... 4,495,000 gal
Average daily pumpage, 1951: 166,000 gal.
Remarks: Water is pumped from the river to the treatment plant, flows through the plant to the clear well, is pumped from the well to the storage tanks and flows from the tanks to the distribution system.

Regular determinations at treatment plant, 1951

Determinations	Raw water			Finished water		
	Avg	Max	Min	Avg	Max	Min
Alkalinity as $CaCO_3$ (ppm)[1]	46.4	70	30	57.1	80	40
pH[2]				7.5	7.6	7.2
Hardness as $CaCO_3$ (ppm)[1]	52.7	70	50	43.2	60	40
Turbidity[3]	97.7	500	30			

[1]8-month record.
[2]6-month record.
[3]9-month record.

Average daily pumpage in gallons, by months, 1951

January	166,000	July	179,000
February	180,000	August	179,000
March	158,000	September	169,000
April	159,000	October	155,000
May	172,000	November	150,000
June	175,000	December	149,000

WOLFE COUNTY

Campton

Population served: 575.
Ownership: Wolfe County High School.
Source: One well, at the high school.
Well 8330–3740–1. Depth, 250 to 260 ft; date drilled 1942(?); water-bearing strata, sandstone in the Lee formation; static water level, 150(?) ft below ground when drilled.
Treatment: None.
Storage: 5,000 gal in a pressure tank in the boiler room of the high school.
Total distribution of water for average year: 1,940,000 gal.
Average daily pumpage, when in operation: 11,000 gal.
Remarks: Water is pumped from the well to the pressure tank and flows from the tank to the distribution system.

Analysis, in parts per million, well 8330–3740–1

(Collected Dec. 16, 1952)

Silica (SiO_2)	11
Iron (Fe)	.24
Manganese (Mn)	.00
Calcium (Ca)	30
Magnesium (Mg)	10
Sodium (Na)	3.9
Potassium (K)	1.4
Bicarbonate (HCO_3)	144
Sulfate (SO_4)	8.4
Chloride (Cl)	1.0
Fluoride (F)	.1
Nitrate (NO_3)	.4
Dissolved solids	134
Hardness as $CaCO_3$	
Total	119
Noncarbonate	0
Temperature (°F)	60
pH	7.4
Specific conductance at 25°C (micromhos)	243

Hazel Green

Population served: 110.
Ownership: Hazel Green Academy, United Christian Missionary Society.
Source: One well, about 1,000 ft south of State Route 119.
Well 8320–3745–1. Depth, 325 ft; diameter, 4 in.; date drilled, June 1948; water-bearing strata, sandstone in the Lee formation; static water level, 147.3 ft below ground, June 4, 1948; yield, 24 gpm.
Treatment: Softening with zeolites; the addition of alum; filtration; chlorination.
Storage: 6,000 gal in an elevated tank.
Total distribution of water for average year: 2,120,000 gal.
Average daily pumpage: 6,000 gal.
Remarks: Water is pumped from the well through the treatment plant to the elevated storage tank, and flows from the storage tank to the distribution system.

Analysis, in parts per million, well 8320–3745–1

(Collected Dec. 15, 1952)

Silica (SiO_2)	12
Iron (Fe)	2.2
Manganese (Mn)	.00
Calcium (Ca)	40
Magnesium (Mg)	12
Sodium (Na)	2.5
Potassium (K)	1.4
Bicarbonate (HCO_3)	188
Sulfate (SO_4)	1.6
Chloride (Cl)	1.4
Fluoride (F)	.2
Nitrate (NO_3)	.6
Dissolved solids	154
Hardness as $CaCO_3$	
Total	150
Noncarbonate	0
Temperature (°F)	56
pH	7.4
Specific conductance at 25°C (micromhos)	289

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