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*Public Groundwater Supplies
in Alexander County*

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PUBLIC GROUNDWATER SUPPLIES IN ALEXANDER COUNTY

by Dorothy M. Woller

Introduction

This publication presents all available information on production wells used for public groundwater supplies in Alexander County. Bulletin 60, which is divided by county into separate publications, supersedes Bulletin 40 and its Supplements and 2.

The definition of public water supply as contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. Systems and wells described furnish water for drinking or general domestic use in: 1) incorporated municipalities; 2) unincorporated communities where 10 or more separate lots or properties are being served or are intended to be served; 3) state-owned parks and memorials; and 4) state-owned educational, charitable, or penal institutions.

This report includes descriptions for groundwater supplies of 2 municipalities and 1 water district in Alexander County. These are preceded by brief summaries of the groundwater geology of the county and the development of groundwater sources for municipal use. An explanation of the format used in the descriptions is also given.

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Geology

The geology of Alexander County is described generally in Illinois State Geological Survey Circular 212, *Groundwater Geology in Southern Illinois*. The following brief discussion of geologic conditions in the county summarizes material contained in that publication. For a more detailed definition of the geology in this portion of the state, the reader is referred to the State Geological Survey which is located on the University of Illinois campus, Urbana.

Unconsolidated water-bearing sand and gravel deposits underlie most of the southern half of Alexander County. These are contained primarily within the bottomlands of the Mississippi, Ohio, and Cache River

Valleys. Sand aquifers in semiconsolidated Cretaceous and Tertiary deposits also have been developed at places in the uplands of this part of the county. Crinoid limestone, dolomite, and chert aquifers of Mississippian, Devonian, and Silurian age generally are tapped for industrial and municipal supplies in the northern part of the county. Here, the unconsolidated formations above bedrock are thin and relatively impermeable.

Sand and gravel wells in the lowland areas may be as deep as 175 ft. Most bedrock wells in the uplands are finished at depths less than 300 ft below ground level.

Groundwater Development for Municipal Use

Unconsolidated sand and gravel deposits associated with the bottomlands of the Mississippi and Cache River Valleys are tapped as sources of municipal water supplies for the McClure East Cape Girardeau Public Water District, located in the northwestern part of the county, and the village of Tamms, located on the eastern side of the county. Two wells, 108 and 171 ft deep, have been constructed in these aquifers during past years. Their reported yields are greater than 100 gpm. Ultimate yields, which are probably much in excess of this amount, depend primarily upon the type of well constructed and the permeability, thickness, and areal extent of the sand and gravel unit tapped by each well. Reported production from municipal wells finished in sand and gravel aquifers of the county was about 80,000 gpd in 1971. Analyses of water from these wells indi-

cate that the iron content ranges widely (from 0.7 to 8.0 mg/l), and the hardness from 371 to 420 mg/l. Water from the McClure East Cape Girardeau Public Water District is aerated and filtered for iron removal, softened, and chlorinated. Water from the village of Tamms is aerated and filtered for iron removal, the pH adjusted, and fluoridated.

A consolidated bedrock aquifer, creviced limestone, is tapped as the primary source of municipal supply for the village of Thebes, located in the western part of the county. The Thebes well is 300 ft deep and is pumped at 100 gpm. The estimated production of this well was 35,000 gpd in 1971. The iron content of water from this well ranges from 0.0 to 0.4 mg/l and the hardness from 308 to 352 mg/l. The water is chlorinated and fluoridated before distribution.

Format

In this publication, the descriptions of public groundwater supplies are presented in alphabetical order by place name as follows: McClure East Cape Girardeau Public Water District, Tamms, and Thebes.

At the beginning of each description the U.S. Census of population for 1970 is given for incorporated places. For unincorporated places, the population is estimated on the basis of the number of services or residential units and an assumed number of 3.5 persons per service.

The number of services and quantity of water distributed at each supply are given where available for the earliest and the latest reported values.

Individual production wells for each supply are described in the order of their construction. The description for each well includes the *aquifer tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses.*

The screen sizes given in this publication are for continuous slot type screens. Slot sizes given indicate the width of the slot openings in thousandths of an inch.

For example, a 20 slot screen has slot openings 0.020 in. wide and a 100 slot screen has slots 0.100 in. wide.

Abbreviations Used

est.....	estimated
ft.....	foot(feet)
gpd.....	gallons per day
gpm.....	gallons per minute
hp.....	horsepower
hr.....	hour(s)
in.....	inch(es)
Lab.....	laboratory
me/l.....	milliequivalents per liter
mg/l.....	milligrams per liter
min.....	minute(s)
No.(s).....	number(s)
pc/l.....	picocuries per liter
R.....	range
rpm.....	revolutions per minute
T.....	township
TDH.....	total dynamic head
Tr.....	trace

McCLURE EAST CAPE GIRARDEAU PUBLIC WATER DISTRICT

The McClure East Cape Girardeau Public Water District (est. 752) installed a public water supply in 1971. One well is in use. In 1972 there were 215 services, all metered; the average and maximum daily pumpages were 45,000 and 55,000 gpd, respectively. The water is aerated and filtered for iron removal, softened, and chlorinated.

WELL NO. 1, finished in sand and gravel, was completed in October 1967 to a depth of 108 ft by Luhr Bros., Inc., Columbia. The well is located at the water treatment plant, approximately 650 ft S and 550 ft E of the NW corner of Section 10, T14S, R3W. The land surface elevation at the well is approximately 340 ft.

A drillers log of Well No. 1 follows:

Formation	Thickness (ft)	Depth (ft)
Clay, silty	20	20
Sand, fine with clay lens	10	30
Sand, medium-coarse	5	35
Sand with very coarse gravel	25	60
Sand with 1½ in. coarse gravel	48	108

A 27-in. diameter hole was drilled to a depth of 108 ft. The well was cased with 12-in. pipe from 5 ft above land surface to a depth of 20 ft (cemented in) and 8-in. pipe from 20 ft below land surface to a depth of 98 ft followed by 10 ft of 8-in. No. 60 slot Johnson stainless steel screen. The annulus is filled with concrete from 4.5 ft above land surface to a depth of 20 ft, with sand from 20 to 54 ft and with gravel from 54 to 108 ft.

A production test was conducted on October 9, 1967, by representatives of the driller, the State Water Survey, and R. M. Harrison & Associates, Consulting Engineers. After 2 hr of pumping at a rate of 210 gpm, the drawdown was 1.05 ft from a nonpumping water lev-

el of 12.27 ft below land surface. Twenty-five min after pumping was stopped, the water level had recovered to 12.32 ft. On the basis of the production test data, it was estimated that this well would yield in excess of the desired 125 gpm (180,000 gpd) on a long-term basis with a pump setting of 41 ft below land surface.

The pumping equipment presently installed is a Johnston vertical turbine pump set at 40 ft, rated at 125 gpm at about 50 ft TDH, and powered by a 3-hp 2500 rpm electric motor. The well is equipped with 45 ft of airline.

The following mineral analysis made by the Environmental Protection Agency (Lab. No. 04704) is for a water sample from the well collected April 3, 1972, after 3 hr of pumping.

WELL NO. 1, LABORATORY NO. 04704

		mg/t	me/l			mg/t	me/l
Iron	Fe	80	0.29	Silica	SiO ₂	29	0.60
Manganese	Mn	0.3	0.01	Fluoride	F	0.3	0.02
Ammonium	NH ₄	0.3	0.02	Boron	B	0.2	
Sodium	Na	7.5	0.33	Nitrate	NO ₃	0.0	0.00
Potassium	K	1.6	0.04	Chloride	Cl	13	0.37
Calcium	Ca	118	5.89	Sulfate	SO ₄	32	0.66
Magnesium	Mg	31	2.55	Alkalinitv	(asCaCO ₃)	364	7.28
Barium	Ba	0.5		Hardness	(asCaCO ₃)	416	
Copper	Cu	0.0		Total dissolved	minerals	430	
Cadmium	Cd	0.0		pH (as recd)	7.6		
Chromium	Cr	0.0		Radioactivity			
Lead	Pb	0.0		Alphapc//	1		
Mercury	Hg	<0.0005		± deviation	1		
Nickel	Ni	0.0		Beta pc//	0		
Silver	Ag	0.0		± deviation	2		
Zinc	Zn	0.05					

TAMMS

The village of Tamms (645) installed a public water supply in 1952. One well is in use. In 1953 there were 138 services, all metered; the estimated average and daily pumpages were 17,000 and 20,000 gpd, respectively. In 1971 there were 235 services, 97 percent metered; the average and maximum daily pumpages were 50,000 and 85,000 gpd, respectively. The water is aerated and filtered for iron removal and the pH adjusted. The supply is also fluoridated.

WELL NO. 1, finished in sand and gravel, was completed in May 1951 to a depth of 171 ft by the Weldon Well Co., Cape Girardeau, Mo. The well is located at the waterworks in the southwest part of town, approximately 1140 ft N and 460 ft W of the SE corner of Section 1. T15S, R2W. The land surface elevation at the well is approximately 340 ft.

A sample study log of Well No. 1 furnished by the State Geological Survey follows:

Formation	Thickness (ft)	Depth (ft)
PLEISTOCENE SERIES		
Silt, very fine sand, brown	10	10
Sand, brown, fine, dirty	15	25
Sand fine, silt dark yellow brown, dirty	25	50
Silt, gray, hard	20	70
Silt, dark yellow brown, hard	15	85
Sand, medium to very coarse, silty	5	90
Sand, fine to medium, clean	5	95
Gravel, granular, very coarse sand	20	115
Sand, dark yellow brown, silty	35	150
Sand, medium, yellow brown, silty, coal fragments	5	155
Gravel, granular; sand, fine to medium	16	171

The well is cased with 8-in. wrought iron pipe from 0.3 ft below the top of the pump base to a depth of 153 ft, and equipped with 20 ft (18 ft exposed) of 8-in. No. 35

slot Johnson Everdur screen.

A production test was conducted on May 19, 1951, by representatives of the driller, village, State Water Survey, and Warren and Van Praag, Inc., Consulting Engineers. After 4.5 hr of pumping at rates increased from 152 to 294 gpm, the drawdown was 9.0 ft from a nonpumping water level of 16.0 ft below land surface. Full recovery was observed 1 hr after pumping was stopped.

The pumping equipment presently installed is a 7-stage Peerless centrifugal pump set at 45 ft, rated at 100 gpm, and powered by a 5-hp 1750 rpm U.S. electric motor (Serial No. 3699205). The pump was rebuilt in January 1971.

The following mineral analysis (Lab. No. 186138) is for a water sample from the well collected July 9, 1971,

after 1 hr of pumping at 100 gpm.

WELL NO. 1. LABORATORY NO. 186138									
		mg/l	me/l			mg/l	me/l		
Iron	Fe	0.7		Silica	SiO ₂	10.6			
Manganese	Mn	0.14		Boron	B	0.0			
Ammonium	NH ₄	Tr	Tr	Fluoride	F	0.2			
Sodium	Na	19.9	0.86	Nitrate	NO ₃	0.5	0.01		
Potassium	K	2.2	0.06	Chloride	Cl	16	0.45		
Calcium	Ca	104.0	5.19	Sulfate	SO ₄	80.8	1.68		
Magnesium	Mg	36.1	2.97	Alkalinity (asCaCO ₃)		342	6.84		
Strontium	Sr	0.18		Hardness (asCaCO ₃)		408	8.16		
Copper	Cu	0.02		Total dissolved					
Cadmium	Cd	0.00		minerals		490			
Chromium	Cr	0.00							
Lead	Pb	<0.05		Turbidity		3			
Lithium	Li	0.01		Color		0			
Nickel	Ni	<0.05		Odor		0			
Zinc	Zn	0.02							

THEBES

The village of Thebes (442) installed a public water supply in 1929. Water was obtained from the Mississippi River until 1964 when a groundwater supply was installed. One well is in use. In 1949 there were 175 services, 85 percent metered; the average daily surface water pumpage was 18,000 gpd. In 1971 there were approximately 300 services, all metered; the average and maximum daily groundwater pumpages were 35,000 and 45,000 gpd, respectively. The water is chlorinated and fluoridated.

WELL NO. 1, finished in limestone, was completed in January 1964 to a depth of 300 ft by the Layne-Western Co., Kirkwood, Mo. The well is located adjacent to the old water treatment plant, approximately 1000 ft W and 1000 ft N of the SE corner of Section 8, T15S, R3W. The land surface elevation at the well is approximately 460 ft.

A drillers log of Well No. 1 follows:

formation	Thickness (ft)	Depth (ft)
Boulders and clay	27	27
Broken rock with clay seams	7	34
Rock and clay	55	89
Rock and clay caving	15	104
Boulder	2	106
Broken rock, lime and flint	10	116
Lime and flint	6	122
Gray lime	28	150
Brown lime	45	195
Lime, mixed color	40	235
Shale	3	238
Lime, mixed color	17	255
Gray lime	45	300

A 15-in. diameter hole was drilled to a depth of

115 ft, reduced to 12 in. between 115 and 150.5 ft, and finished 8 in. in diameter from 150.5 to 300 ft. The well is cased with 12-in. pipe from land surface to a depth of 114.6 ft and with 8-in. pipe (cemented in) from land surface to a depth of 150.5 ft.

A production test was conducted by the driller on January 8-10, 1964. After 5.4 hr of pumping at a rate of 56 gpm, the drawdown was 115 ft from a nonpumping water level of 68 ft.

The pumping equipment presently installed is a Myers submersible pump rated at 54 gpm at about 260 ft head.

The following mineral analysis. (Lab. No. 186343) is for a water sample from the well collected July 30, 1971, after 30 min of pumping at 100 gpm.

WELL NO. 1. LABORATORY NO. 186343									
		mg/l	me/l			mg/l	me/l		
Iron	Fe	0.2		Silica	SiO ₂	20.7			
Manganese	Mn	0.00		Boron	B	0.3			
Ammonium	NH ₄	Tr	Tr	Fluoride	F	0.2			
Sodium	Na	20.0	0.87	Nitrate	NO ₃	21.6	0-35		
Potassium	K	1.0	0.03	Chloride	Cl	18	0-51		
Calcium	Ca	108.8	5.43	Sulfate	SO ₄	39.7	0.83		
Magnesium	Mg	19.6	1.61	Alkalinity (asCaCO ₃)		308	6.16		
Strontium	Sr	0.09		Hardness (as CaCO ₃)		352	7.04		
Copper	Cu	0.01		Total dissolved					
Cadmium	Cd	0.00		minerals		446			
Chromium	Cr	0.00							
Lead	Pb	<0.05		Turbidity		8			
Lithium	Li	0.00		Color		0			
Nickel	Ni	<0.05		Odor		0			
Zinc	Zn	0.02							