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*Public Groundwater Supplies
in Edgar County*

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ILLINOIS STATE WATER SURVEY

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PUBLIC GROUNDWATER SUPPLIES IN EDGAR COUNTY

by Dorothy M. Woller

Introduction

This publication presents all available information on production wells used for public groundwater supplies in Edgar County. Bulletin 60, which is divided by county into separate publications, supersedes Bulletin 40 and its Supplements 1 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 separate descriptions for groundwater supplies of 7 municipalities in Edgar 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 Edgar County is described generally in Illinois State Geological Survey Circular 248, *Groundwater Geology in East-Central 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.

The unconsolidated materials forming the present day land surface in Edgar County vary greatly in thickness and water-yielding character. East of Paris, in the east-central part of the county, the unconsolidated materials are thin (less than 50 ft) and consist principally of nonwater-yielding glacial till. In the remainder of the county the unconsolidated materials range in thickness up to 150 or 200

ft and contain scattered sand and gravel deposits capable of yielding moderate quantities of groundwater. Outwash sand and gravel deposits having potential for development of moderate supplies are associated with the southern slopes of the end moraines trending east and west across the county. Thicker and more extensive sand and gravel deposits normally are located near drainage ways leading from the end moraines.

Beneath the glacial deposits are the upper-bedrock units of Pennsylvanian age. These rocks consist principally of shale with only thin beds of water-yielding sandstone or creviced limestone. They are capable of producing only limited quantities of water. Below depths of 100 to 150 ft, water contained in these rocks generally is too highly mineralized for most uses.

Groundwater Development for Municipal Use

Sand and gravel deposits in the unconsolidated materials above bedrock are tapped as the sources for municipal water supplies at Brocton, Chrisman, Hume, Kansas, Metcalf, Redmon, and Vermilion. There are presently 14 municipal production and standby wells tapping these aquifers to depths ranging from 38 to 165 ft. Their reported yields range from 23 to 348 gpm depending primarily upon the type of well constructed and the permeability, thickness, and areal extent of the sand and gravel unit tapped by each well. Estimated production from these wells averaged about 270,000 gpd in 1972 and 1973. Past and present analyses of water they produce indicate that the iron content ranges from 0.0 to 8.2 mg/L, and the hardness from 236 to 396 mg/l. Groundwater for the municipal supplies of

Brocton and Chrisman is aerated, settled, filtered, chlorinated, and fluoridated. The water for Hume and Vermilion is aerated, filtered, chlorinated, and fluoridated. At Kansas and Redmon the water is aerated, settled, fed potassium permanganate, filtered, chlorinated, and fluoridated; in addition the water at Kansas is softened and treated with polyphosphate. The water for Metcalf is chlorinated, filtered, fluoridated, and treated with polyphosphate to keep iron in solution.

The upper-bedrock units of Pennsylvanian age are tapped by one well as a standby source at Chrisman. This well is 165 ft deep. No yield data are available. An analysis of water from this well indicated that the iron content is 2.5 mg/l and the hardness is 271 mg/l.

Format

In this publication the descriptions of public groundwater supplies are presented in alphabetical order by place name as follows: Brocton, Chrisman, Hume, Kansas, Metcalf, Redmon, Vermilion.

At the beginning of each description the U. S. Census of population for 1970 is given for incorporated places.

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 screens unless stated otherwise. 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. Approximate equivalent slot openings for other types of screens are given in parentheses after the screen designation.

Abbreviations Used

ft.....	foot (feet)
gal.....	gallon(s)
gpd.....	gallons per day
gpm.....	gallons per minute
hp.....	horsepower
hr.....	hour(s)
HTH.....	high test hypochlorite
in.....	inch(es)
Lab.....	laboratory
lb.....	pound(s)
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

BROCTON

The village of Brocton (349) installed a public water supply in 1963. One well is in use. In 1963 there were 100 services, all metered; the estimated average daily pumpage was 15,000 gpd. In 1973 there were 155 services, all metered; the average and maximum daily pumpages were 30,000 and 35,000 gpd, respectively. The water is aerated, settled, filtered, chlorinated and fluoridated.

WELL NO. 1, finished in sand and gravel, was completed in May 1962 to a depth of 38 ft by J. B. Ortman & Sons, Kokomo, Ind. The well is located about 0.5 mile northeast of the treatment plant and about 30 ft from the Nickel Plate RR, approximately 3960 ft N and 2640 ft W of the SE corner of Section 25, T15N, R14W. The land surface elevation at the well is approximately 665 ft.

A drillers log of Well No. 1 follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Soil	5	5
Yellow clay	20	25
Silty clay	5	30
Sand, gravel, some clay	3	33
Sand and gravel	5	38
Clay below		

A 10-inch diameter hole was drilled to a depth of 38 ft. The well is cased with 10-in. steel pipe from land surface to a depth of 33 ft followed by 5 ft of No. 80 slot Cook red brass screen.

A production test was conducted on May 16, 1962, by representatives of the driller, the village, the State Water Survey, and Nelson Watson, Jr. & Assoc, Consulting Engineers.

After 1.8 hr of pumping at rates of 132.8 to 130.0 gpm, the drawdown was 18.0 ft from a nonpumping water level of 4.8 ft below land surface. Fifteen min after pumping was stopped, the water level had recovered to 8.8 ft. On the basis of the production test data, it was estimated that this well would yield 100 gpm (144,000 gpd) on a long-term basis.

The pumping equipment presently installed is a Deming turbine pump rated at 60 gpm at about 70 ft TDH, and powered by a 2-hp U. S. electric motor.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B0019534) is for a water sample from the well collected May 16, 1972. The iron content in previous samples has been as great as 3.2 mg/l.

WELL NO. 1, LABORATORY NO. B0019534									
		<i>mg/l</i>	<i>me/l</i>			<i>mg/l</i>	<i>me/l</i>		
Iron	Fe	0.2	0.01	Silica	SiO ₂	18.5			
Manganese	Mn	0.0		Fluoride	F	0.3	0.0 2		
Ammonium	NH ₄	2.9	0.16	Boron	B	0.2			
Sodium	Na	9.5	0.41	Nitrate	NO ₃	0.4	0.01		
Potassium	K	0.8	0.02	Chloride	Cl	7	0.20		
Calcium	Ca	72	3.59	Sulfate	SO ₄	25	0.52		
Magnesium	Mg	31.5	2.59	Alkalinity (as CaCO ₃)		290	5.8		
Barium	Ba	0.1		Hardness (as CaCO ₃)		308			
Copper	Cu	0.0		Total dissolved minerals		362			
Cadmium	Cd	0.00		pH(asrec'd)		7.3			
Chromium	Cr	0.0		Radioactivity					
Lead	Pb	0.00		Alpha pc/l		0.0			
Mercury	Hg	< 0.0005		±deviation		1.1			
Nickel	Ni	0.0		Beta pc/l		0.0			
Silver	Ag	0.00		±deviation		1.0			
Zinc	Zn	0.03							

CHRISMAN

The city of Chrisman (1285) installed a public water supply in 1905. Two wells (Nos. 4 and 5) are in use and three wells (Nos. 1, 2, and 3) are available for emergency use. In 1950 there were 395 services, all metered; the estimated average and maximum daily pumpages were 70,000 and 80,000 gpd, respectively. In 1973 there were 582 services, all metered; the estimated average and maximum daily pumpages were 138,000 and 268,000 gpd, respectively. The water from Wells No. 4 and 5 is aerated, settled, chlorinated, filtered, and fluoridated.

WELL NO. 1, finished in sand and gravel, was completed in 1905 to a depth of 132 ft (originally drilled to 150 ft) by A. M. Dillow, Decatur. This well is available for emergency use. The well is located on the north side of the Baltimore and Ohio RR at its intersection with Ohio St., approximately 2500 ft S and 900 ft W of the NE corner of Section 35, T16N, R12W. The land surface elevation at the well is approximately 640 ft.

A correlated drillers log of Well No. 1 furnished by the State Geological Survey follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
PLEISTOCENE SYSTEM		
Dirt and clay	18	18
Sand, water	2	20
Clay	66	86
Sand, water	6	92
Clay	28	120
Sand, water	12	132
PENNSYLVANIAN SYSTEM		
Limestone, some shale at base	18	150

A 10-in. diameter hole was drilled to a depth of 150 ft. Originally, the well was cased with 10-in. pipe from about 2 ft above the pumphouse floor to a depth of 132 ft. The bottom 14 ft of this casing was perforated with 3/8-in. holes. In 1913, when the well was found to have filled in to a depth of 128 ft, a 12-ft length of 8-in. perforated iron pipe wrapped with No. 16 mesh wire was placed from 116 ft to a depth of 128 ft.

Nonpumping water levels were reported as follows: 49 ft below land surface in 1912; 43.2 ft on July 30, 1923; and 56 ft in 1945 when Well No. 2 was operating.

Wells No. 1, 2, and 3 are pumped by air using two

Ingersoll Rand air compressors powered by 20- and 30-hp electric motors. Water flows by gravity to a small concrete collecting reservoir located over Well No. 1 and is pumped to the main by a Gardner and Denver high pressure pump powered by a 2-hp electric motor. Well No. 1 is equipped with 122.2 ft of 1-in. airpipe and 3-in. discharge pipe.

A partial analysis of a sample (Lab. No. 114992) collected June 12, 1948, after pumping for 4.5 hr at 30 gpm, showed the water to have a hardness of 340 mg/l, total dissolved minerals of 823 mg/l, and an iron content of 5.0 mg/l.

WELL NO. 2, open to sand and gravel and Pennsylvanian limestone, was completed in 1926 to a depth of 165 ft by the Meister Bros., Tuscola. This well is available for emergency use. The well is located about 100 ft N of Well No. 1, approximately 2400 ft S and 900 ft W of the NE corner of Section 35, T16N, R12W. The land surface elevation at the well is approximately 640 ft.

A drillers log of Well No. 2 follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Dirt and clay	18	18
Sand	2	20
Clay	66	86
Sand and silt	6	92
Clay	28	120
Water-bearing sand	12	132
Limestone	15	147
Shale	18	165

A 10-in. diameter hole was drilled to a depth of 132 ft and finished 8 in. in diameter from 132 to 165 ft. The well is cased with 10-in. pipe from 3 ft above land surface to a depth of 120 ft. Originally, a Cook screen was installed in the well, but because of rapid clogging, it was immediately replaced by a 16-ft length of 8-in. perforated casing (with 0.5-in. holes) between the depths of 116 and 132 ft.

In 1945, when Well No. 1 was operating, the nonpumping water level was reported to be 56 ft.

On January 28, 1947, the village treated this well with chlorinated lime and muriatic acid. Before treatment, the well reportedly produced 36 gpm; a 10 percent increase in production was reported.

In February 1947, the nonpumping water level was reported to be 51 ft below the top of the well.

The pumping equipment presently installed is as listed under Well No. 1. This well is equipped with 160.5 ft of 1-in. airpipe and 3-in. discharge pipe.

A mineral analysis of a sample (Lab. No. 114991) collected June 12, 1948, after pumping for 4.5 hr at 40 gpm, showed the water to have a hardness of 271 mg/l, total dissolved minerals of 549 mg/l, and an iron content of 2.5 mg/l.

WELL NO. 3, finished in sand and gravel, was completed in June 1948 to a depth of 124.5 ft by Harry Cramer, Westville. This well is available for emergency use. The well is located 125 ft NE of Well No. 1 and 90 ft E of Well No. 2,

approximately 2400 ft S and 810 ft W of the NE corner of Section 35, T16N, R12W. The land surface elevation at the well is approximately 640 ft.

A drillers log of Well No. 3 follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Clay	15	15
Sand	6	21
Shale	38	59
Gravel	7	66
Soft shale	41	107
Sand and gravel	17.5	124.5
Hard shale	40.5	165

A 10-in. diameter hole was drilled to a depth of 128 ft and finished 8 in. in diameter from 128 to 165 ft. The well is cased with 10-in. steel pipe from about 2 ft above land surface to a depth of 107 ft and an 8-in. steel pipe from 107 ft to a depth of 165 ft. The 8-in. pipe was perforated from 107 ft to a depth of 124.5 ft.

The pumping equipment presently installed is as listed under Well No. 1. This well is equipped with 160 ft of 1.2-in. airpipe and 3-in. discharge pipe.

A mineral analysis of a sample (Lab. No. 114993) collected June 12, 1948, after pumping for 4.5 hr at 80 gpm, showed the water to have a hardness of 279 mg/l, total dissolved minerals of 532 mg/l, and an iron content of 6.0 mg/l.

WELL NO. 4, finished in sand and gravel, was completed in November 1953 to a depth of 96 ft by the Sims Drilling Co., Savoy. The well is located at the intersection of Washington and Ohio Sts., approximately 1080 ft straight W of the SE corner of Section 26, T16N, R12W. The land surface elevation at the well is approximately 628 ft.

A 16-in. diameter hole was drilled to a depth of 96 ft. The well is cased with 8-in. pipe from 2.7 ft above land surface to a depth of 80.7 ft followed by 15.3 ft of 8-in. No. 60 slot Johnson screen. The annulus between the bore hole and casing-screen assembly is filled with gravel from an unknown depth to 96 ft.

A production test was conducted on November 12, 1953, by representatives of the driller, the city, the State Water Survey, and Mr. John Bloss, Consulting Engineer. After 5.4 hr of pumping at rates of 133 to 250 gpm, the drawdown was 19.5 ft from a nonpumping water level of 12.0 ft below land surface. The water level recovered to 17.0 ft after the pump had been shut off 1.2 hr.

On June 13, 1960, the driller reported that the well produced 200 gpm for 2 hr with a drawdown of 11 ft from a nonpumping water level of 14 ft. Twenty min after pumping was stopped, the water level had recovered to 16 ft.

A production test was conducted by the State Water Survey on March 7, 1961. After 4.2 hr of pumping at rates of 109 to 103 gpm, the drawdown was 3.1 ft from a nonpumping water level of 16.2 ft below land surface. Fifty min after pumping was stopped, the water level had recovered to 16.9 ft.

The pumping equipment presently installed consists of a 15-hp 1800 rpm U. S. electric motor (Serial No. 2330946), an 8-in., 4-stage Layne turbine pump (No. 70465) set at 50 ft, rated at 200 gpm, and 50 ft of 5-in. column pipe. The well is equipped with 50 ft of airline.

A mineral analysis of a sample (Lab. No. 185299) collected March 30, 1971, after pumping for 15 min at 105 gpm, showed the water to have a hardness of 268 mg/l, total dissolved minerals of 456 mg/l, and an iron content of 5.6 mg/l. Hydrogen sulfide was apparent on a previous sample.

WELL NO. 5, finished in sand and gravel, was completed in March 1971 to a depth of 92 ft by the Layne-Western Co., Kirkwood, Mo. The well is located 60 ft N of Well No. 4, approximately 60 ft N and 1080 ft W of the SE corner of Section 26, T16N, R12W. The land surface elevation at the well is approximately 625 ft.

A drillers log of Well No. 5 follows:

Strata	Thickness (ft)	Depth (ft)
Top soil	4	4
Loam sand, clay	2	6
Coarse gravel	9	15
Gray clay, gravel mixed	48	63
Gray clay, sand layers	10	73
Sand and gravel	20	93
Hard clay	7	100

A 20-in. diameter hole was drilled to a depth of 92 ft. The well is cased with 8-in. steel pipe from 2 ft above land surface to a depth of 72 ft followed by 20 ft of 8-in. No. 6 (0.080 in.) Layne shutter screen. The top of the well casing is equipped with a Monitor pitless adapter. The annulus between the bore hole and pitless-casing-screen assembly is filled with dirt from 0 to 6 ft, with concrete from

6 to 16 ft, with sandfill from 16 to 35 ft, and with Meramec gravel from 35 to 92 ft.

A production test using one observation well was conducted on March 30, 1971, by representatives of the driller, the city, the State Water Survey, and Dale Francis & Assoc, Consulting Engineers. After 3 hr of pumping at rates of 351 to 348 gpm, the drawdown was 21.03 ft from a non-pumping water level of 38.65 ft below land surface. Thirty min after pumping was stopped, the water level had recovered to 42.84 ft.

The pumping equipment presently installed is a Layne submersible pump (Model No. 65013) set at 75 ft, rated at 400 gpm at about 100 ft TDH, and powered by a 15-hp Franklin electric motor. The well is equipped with 62 ft of airline.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. 01597) is for a water sample from the well collected September 20, 1971. Methane gas was present on a previous analysis.

WELL NO. 5, LABORATORY NO. 01597					
		mg/l	me/l		
Iron	Fe	4.5	0.16	Silica	SiO ₂ 18.5
Manganese	Mn	0.0		Fluoride	F 0.5 0.03
Ammonium	NH ₄	16.4	0.91	Nitrate	NO ₃ 0.0
Sodium	Na	88	3.83	Chloride	Cl 39 1.10
Potassium	K	2.3	0.06	Sulfate	SO ₄ 8.0 0.17
Calcium	Ca	60	2.99	Alkalinity (as CaCO ₃)	428 8.56
Magnesium	Mg	30.1	2.47		
				Hardness (as CaCO ₃)	268
Barium	Ba	0.6		Total dissolved minerals	500
Copper	Cu	0.0		pH (as rec'd)	6.9
Cadmium	Cd	0.00		Radioactivity	
Chromium	Cr	0.0		Alpha pc/l	2
Lead	Pb	0.0		± deviation	1
Mercury	Hg	<0.0005		Beta pc/l	5
Nickel	Ni	0.0		± deviation	3
Silver	Ag	0.0			
Zinc	Zn	0.1			

HUME

The village of Hume (496) installed a public water supply in 1955. One well is in use. In 1955 there were 100 services, all metered. In 1972 there were 188 services, all metered; the average and maximum daily pumpages were 35,000 and 45,000 gpd, respectively. The water is in-line aerated, chlorinated, fluoridated, and filtered.

WELL NO. 1, finished in sand and gravel, was completed in October 1954 to a depth of 55.2 ft by the Layne-Western Co., Aurora. The well is located on Center St. one block south of the elevated tank, approximately 1690 ft N and 1800 ft W of the SE corner of Section 31, T16N, R13W. The land surface elevation at the well is approximately 652 ft.

A 12-in. diameter hole was drilled to a depth of 55.2 ft. The well is cased with 8-in. steel pipe from 1 ft above land surface to a depth of 40.2 ft followed by 15 ft of 8-in. No. 8 (0.030 in.) Layne shutter screen.

A correlated drillers log of Well No. 1 furnished by the State Geological Survey follows:

Strata	Thickness (ft)	Depth (ft)
PLEISTOCENE SERIES		
Top soil - black gumbo	5	5
Yellow and gray clay	4	9
Fine yellow sand	14	23
Fine sand to medium gravel	10	33
Fine sand to more medium gravel clean and loose	10	43
Fine sand to coarse gravel	12	55

A production test was conducted on October 26, 1954, by representatives of the driller, the village, the State Water Survey, and Caldwell-Rhoads Co., Consulting Engineers. After 6 hr of pumping at rates of 100 to 130 gpm, the drawdown was 4.0 ft from a nonpumping water level of 9.0 ft below land surface. Four min after pumping was stopped, the water level had recovered to 8.7 ft.

In 1955, the nonpumping water level was reported to be 15 ft.

On March 7, 1957, the Layne-Western Co. reported that after pumping for less than a minute, the water level was below the 30-ft airline from a nonpumping water level of 11 ft. During the next minute, after pumping at approximately 100 gpm, the well broke suction. Pumping was then decreased to 75 gpm for the next 15 min. Three min after pumping was stopped, the water level had recovered to 12 ft.

This well was reportedly acidized in July 1959.

On June 4, 1964, the water was pulled down below the airline when pumping at 60 gpm. On June 5, 1964, the well was acidized with 150 gal of acid by E. C. Baker & Sons, Sigel. After acidizing, the well reportedly produced 128 to 135 gpm for 53 min with a drawdown of 6.5 ft from a nonpumping water level of 11.5 ft.

On February 27, 1970, E. C. Baker & Sons acidized the well with 150 gal of Dowell X blended acid with a non-toxic inhibitor, flushed, treated with 3.8 lb of 20 percent HTH chlorine, flushed, and restored the well to service. Production reportedly increased from 65 to 125 gpm.

The pumping equipment presently installed consists of a

7 1/2-hp 1800 rpm U. S. electric motor, a Layne turbine pump set at 30 ft, rated at 100 gpm, and 30 ft of 4-in. column pipe. A 10-ft section of 4-in. suction pipe is attached to the pump intake. The well is equipped with 60 ft of airline.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. 01377) is for a water sample from the well collected September 8, 1971. The iron content in previous samples has been as great as 1.7 mg/l.

WELL NO. 1, LABORATORY NO. 01377									
		mg/l	me/l			mg/l	me/l		
Iron	Fe	0.05	0.00	Silica	SiO ₂	13			
Manganese	Mn	0.1	0.00	Fluoride	F	0.2	0.01		
Ammonium	NH ₄	0.4	0.02	Nitrate	NO ₃	0.4	0.01		
Sodium	Na	10.5	0.46	Chloride	Cl	13	0.37		
Potassium	K	1.0	0.03	Sulfate	SO ₄	106	2.20		
Calcium	Ca	86.4	4.31	Alkalinity (as CaCO ₃)		230	4.60		
Magnesium	Mg	31	2.55						
				Hardness (as CaCO ₃)		348			
Barium	Ba	0.0							
				Total dissolved					
Copper	Cu	0.0		minerals		398			
Cadmium	Cd	0.00							
Chromium	Cr	0.0		pH (as rec'd)		7.6			
Lead	Pb	0.00		Radioactivity					
Mercury	Hg	<0.0005		Alpha pc/l		0			
Nickel	Ni	0.0		± deviation		0			
Silver	Ag	0.0		Beta pc/l		1			
Zinc	Zn	0.0		± deviation		2			

KANSAS

The village of Kansas (779) installed a public water supply in 1915. Three wells (Nos. 2, 3, and 4) are in use. In 1950 there were 232 services, all metered; the average daily pumpage was 30,000 gpd. In 1973 there were 350 services, all metered; the average and maximum daily pumpages were 45,000 and 90,000 gpd, respectively. The water is aerated, settled, fed a potassium permanganate solution, filtered, softened, chlorinated, fluoridated, and treated with polyphosphate to keep iron in solution.

WELL NO 1, finished in sand and gravel, was completed in 1914 to a depth of 80 ft. This well was abandoned in 1925 and sealed in 1947. The well was located on Cherry Ave. 330 ft E of Front St., approximately 2400 ft S and 1560 ft E of the NW corner of Section 26, T13N, R14W. The land surface elevation at the well is approximately 713 ft.

A correlated drillers log of Well No. 1 furnished by the State Geological Survey follows:

Strata	Thickness (ft)	Depth (ft)
PLEISTOCENE SYSTEM		
Loam and clay	12	12
Sand	5	17
Clay	15	32
Sand and gravel	50	82

A 10-in. diameter hole was drilled to a depth of 82 ft. The well was cased with 10-in. wrought iron pipe from land

surface to a reported depth of 68 ft and equipped with 12 ft of screen.

In 1918, the nonpumping water level was reported to be 14 ft below the pumphouse floor.

A mineral analysis of a sample (Lab. No. 38810) collected January 8, 1918, showed the water to have a hardness of 340 mg/l, total dissolved minerals of 450 mg/l, and an iron content of 3.0 mg/l.

WELL NO. 2, finished in sand, was constructed in 1925 to a depth of 76 ft and reportedly deepened to 86 ft. The well is located at the east end of Maple St., approximately 2100 ft S and 2000 ft E of the NW corner of Section 26, T13N, R14W. The land surface elevation at the well is approximately 713 ft.

An 8-in. diameter hole was drilled to a depth of 86 ft. The well is cased with 8-in. iron pipe to a depth of 67 ft followed by 19 ft of 8-in. screen.

In 1927 and 1948, the nonpumping water level was reported to be 13 ft.

The pumping equipment presently installed consists of a 10-hp 1140 rpm Wagner electric motor, an A. D. Cook plunger pump rated at 80 gpm, and 52 ft of column pipe. A 15.3-ft section of 4-in. suction pipe is attached to the pump intake.

A mineral analysis of a sample (Lab. No. 115045) col-

lected June 16, 1948, after pumping for 1 hr at 80 gpm, showed the water to have a hardness of 377 mg/l, total dissolved minerals of 423 mg/l, and an iron content of 3.1 mg/l. Methane gas also was present in this sample.

WELL NO. 3, finished in sand and gravel, was completed in 1932 to a depth of 85 ft by E. W. Johnson, Bloomington. The well is located 13 ft E and 13 ft S of Well No. 2, approximately 2113 ft S and 1573 ft E of the NW corner of Section 26, T13N, R14W. The land surface elevation at the well is approximately 713 ft.

A 10-in. diameter hole was drilled to a depth of 85 ft. The well is cased with 10-in. iron pipe to a depth of 73 ft followed by 12 ft of 10-in. Johnson screen.

The pumping equipment presently installed is a Peerless turbine pump set at 70ft, rated at 100 gpm at about 231 ft TDH, and powered by a 10-hp General Electric motor. The well is equipped with 70 ft of airline.

A mineral analysis of a sample made by the Illinois Environmental Protection Agency (Lab. No. 01364) collected September 7, 1971, after pumping for 40 min at 120 gpm, showed the water to have a hardness of 380 mg/l, total dissolved minerals of 451 mg/l, and an iron content of 0.5 mg/l. The iron content on a previous sample was 1.7 mg/l.

WELL NO. 4, finished in sand and gravel, was completed in August 1965 to a depth of 85 ft by the J. P. Miller Artesian Well Co., Brookfield. The well is located 640 ft W of the treatment plant, approximately 2240 ft S and 2200 ft E of the NW corner of Section 26, T13N, R14W. The land surface elevation at the well is approximately 713 ft.

A 30-in. diameter hole was drilled to a depth of 85 ft. The well is cased with 12-in. welded steel pipe from 1.5 ft above the pumphouse floor to a depth of 70 ft followed by 15 ft of 12-in. No. 50 slot A. D. Cook stainless steel screen. The annulus between the bore hole and casing-screen assembly is filled with impervious material from 0 to 54

ft, and with silica gravel from 54 to 85 ft.

Upon completion, the driller reported that the well produced 240 gpm for 24 hr with a drawdown of 20 ft from a nonpumping water level of 23 ft.

The pumping equipment presently installed is a Peerless turbine pump set at 50 ft, rated at 100 gpm at about 233 ft TDH, and powered by a 10-hp General Electric motor. The well is equipped with 50 ft of airline.

A drillers log of well No. 4 follows:

Strata	Thickness (ft)	Depth (ft)
Loam and clay	5	5
Yellow clay	7	12
Blue clay	8	20
Fine sand, gravel, and clay	16	36
Coarse gravel	4	40
Clay	3	43
Clay and sand	19	62
Sand and gravel	23	85

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. 01379) is for a water sample from the well collected September 8, 1971, after 40 min of pumping at 125 gpm. On a previous sample iron was detected.

WELL NO. 4, LABORATORY NO. 01379					
		mg/l	me/l		mg/l me/l
Iron	Fe	0.0		Silica	SiO ₂ 23
Manganese	Mn	0.0		Fluoride	F 0.3 0.02
Ammonium	NH ₄	12.6	0.70	Nitrate	NO ₃ 0.0
Sodium	Na	21.7	0.94	Chloride	Cl 4.5 0.13
Potassium	K	2.0	0.05	Sulfate	SO ₄ 3 0.06
Calcium	Ca	80	3.99	Alkalinity (as CaCO ₃)	376 7.52
Magnesium	Mg	33	2.71	Hardness (as CaCO ₃)	336
Barium	Ba	0.3		Total dissolved	
Copper	Cu	0.0		minerals	400
Cadmium	Cd	0.00		pH (as rec'd)	7.1
Chromium	Cr	0.0		Radioactivity	
Lead	Pb	0.0		Alpha pc/l	1
Mercury	Hg	<0.0005		±deviation	1
Nickel	Ni	0.0		Beta pc/l	0
Silver	Ag	0.0		±deviation	0
Zinc	Zn	0.0			

METCALF

The village of Metcalf (269) installed a public water supply in 1955. One well is in use. In 1956 there were 27 services, all metered; the average and maximum daily pumpages were 1500 and 2000 gpd, respectively. In 1972 there were 88 services, all metered; the average and maximum daily pumpages were 9000 and 11,000 gpd, respectively. The water is chlorinated, fluoridated, and treated with polyphosphate to keep iron in solution.

WELL NO. 1, finished in sand and gravel, was completed in January 1955 to a depth of 75 ft by the Layne-Western Co., Aurora. The well is located on Front St. in the southern part of the village, approximately 2450 ft N and 420 ft W of the SE corner of Section 34, T16N, R13W. The land surface elevation at the well is approximately 662 ft.

A sample study log of Well No. 1 furnished by the State

Geological Survey follows:

Strata	Thickness (ft)	Depth (ft)
PLEISTOCENE SERIES		
Soil and till, silty, yellow-brown	5	5
Till, sandy, silty (gravelly between 25 and 30 ft), gray to brown	55	60
Sand, fine, very silty, brown	10	70
Till, sandy, silty, gray	23	93

An 8-in diameter hole was drilled to a depth of 75 ft. The well is cased with 8-in. steel pipe from 2 ft above land surface to a depth of 60 ft followed by 15 ft of 8-in. No. 40 slot Keystone bronze screen.

A production test was conducted on February 2, 1955, by representatives of the driller, the village, the State Water Survey, and Caldwell-Rhoads Co., Consulting Engineers.

After 4.9 hr of pumping at varying rates of 128 to 153 gpm, the drawdown was 5.2 ft from a nonpumping water level of 13.5 ft below land surface. Thirty-three min after pumping was stopped, the water level had recovered to 14.9 ft.

In 1956, the nonpumping water level was reported to be 18 ft.

The pumping equipment presently installed consists of a 7 1/2-hp 1800 rpm U. S. electric motor, a Layne turbine pump set at 30 ft, rated at 125 gpm, and 30 ft of 4-in. column pipe. A 10-ft section of 4-in. suction pipe is attached to the pump intake. The well is equipped with 56.7 ft of airline.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. 01769) is for a water sample from the well collected September 29, 1971.

The iron content in a previous sample was 1.9 mg/l.

WELL NO. 1, LABORATORY NO. 01769

		mg/l	me/l			mg/l	me/l
Iron	Fe	0.5	0.02	Silica	SiO ₂	22	
Manganese	Mn	0.0		Fluoride	F	0.63	0.03
Ammonium	NH ₄	4.0	0.22	Nitrate	NO ₃	0	
Sodium	Na	110	4.78	Chloride	Cl	95	2.68
Potassium	K	1.2	0.03	Sulfate	SO ₄	0	
Calcium	Ca	81.6	4.07	Alkalinity (as CaCO ₃)		390	7.80
Magnesium	Mg	25	2.06	Hardness (as CaCO ₃)		296	
Barium	Ba	0.0		Total dissolved minerals		627	
Copper	Cu	0.0					
Cadmium	Cd	0.00					
Chromium	Cr	0.0		pH (as rec'd)		7.2	
Lead	Pb	0.00		Radioactivity			
Mercury	Hg	<0.0005		Alpha pc/l		1	
Nickel	Ni	0.0		±deviation		1	
Silver	Ag	0.0		Beta pc/l		1	
Zinc	Zn	0.0		±deviation		2	

REDMON

The village of Redmon (251) installed a public water supply in 1969. One well is in use. In 1969 there were 84 services, all metered. In 1973 there were 90 services, all metered; the estimated average and maximum daily pumpages were 9,000 and 12,000 gpd, respectively. The water is aerated, settled, chlorinated, fed a potassium permanganate solution, filtered through a green sand filter, and fluoridated.

In an attempt to develop a public water supply, a well finished in sand was completed in August 1966 to a depth of 74 ft by Dudley Drillers, Paris. This well was never developed for the village supply because of sand entering the well. The well was located in the SW 1/4 of the SE 1/4 of Section 21, T14N, R13W. An 8-in. diameter hole was drilled to a depth of 74 ft and cased with 8-in. pipe from 1 ft above land surface to a depth of 74 ft (slotted from 40 to 57 ft). A production test was conducted on August 26, 1966, by representatives of the State Water Survey and Dale E. Francis & Assoc, Consulting Engineers. After 2 hr of pumping at varying rates of 26 to 32 gpm, the final drawdown was 31.29 ft from a nonpumping water level of 20.39 ft below land surface. One hr after pumping was stopped the water level had recovered to 22.52 ft. On the basis of the production test data, it was estimated that this well would yield 10 gpm (14,400 gpd) on a long-term basis.

WELL NO. 1, finished in sand and gravel, was completed in January 1967 to a depth of 66 ft by E. C. Baker & Sons, Sigel. The well is located on the waterworks grounds in the southwest corner of the village, approximately 350 ft N and 1525 ft E of the SW corner of Section 21, T14N, R13W. The land surface elevation at the well is approximately 675 ft.

An 8-in. diameter hole was drilled to a depth of 66 ft. The well is cased with 8-in. cast iron pipe from 2 ft above land surface to a depth of 58 ft followed by 8 ft of 8-in. No. 30 slot Cook red brass screen.

A drillers log of Well No. 1 follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Soil	2	2
Yellow clay	13	15
Blue clay	15	30
Blue dirty sand	8	38
Green clay	10	48
Fine sand	3	51
Coarse sand	4	55
Sand and gravel	11	66
Packed sand and gravel	1	67

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. 01631) is for a water sample from the well collected September 20, 1971. Methane gas has been present in previous analyses.

WELL NO. 1, LABORATORY NO. 01631

		mg/l	me/l			mg/l	me/l
Iron	Fe	3.0	0.11	Silica	SiO ₂	28	
Manganese	Mn	0.0		Fluoride	F	0.45	0.02
Ammonium	NH ₄	14.1	0.78	Nitrate	NO ₃	0.0	
Sodium	Na	32	1.39	Chloride	Cl	9.2	0.26
Potassium	K	1.9	0.05	Sulfate	SO ₄	2	0.04
Calcium	Ca	98	4.89	Alkalinity (as CaCO ₃)		458	9.16
Magnesium	Mg	33.8	2.78	Hardness (asCaCO ₃)		383	
Barium	Ba	0.3	5	Total dissolved minerals		503	
Copper	Cu	0.0					
Cadmium	Cd	0.00		pH (as rec'd)		7.1	
Chromium	Cr	0.0		Radioactivity			
Lead	Pb	0.00		Alpha pc/l		4	
Mercury	Hg	<0.0005		±deviation		2	
Nickel	Ni	0.0		Beta pc/l		2	
Silver	Ag	0.0		±deviation		3	
Zinc	Zn	0.0					

A production test using one observation well was conducted on January 30, 1967, by representatives of the driller, the State Water Survey, and Dale E. Francis & Assoc, Consulting Engineers. After 3.3 hr of pumping at a rate of 50.5 gpm, the drawdown was 11.08 ft from a nonpumping water level of 10.83 ft below land surface. One hr after

pumping was stopped, the water level had recovered to 15.01 ft. On the basis of the production test data, it was estimated that this well would yield 50 gpm (72,000 gpd) on a long-term basis.

The pumping equipment presently installed is a Myers submersible pump (Serial No. R847) set at 58 ft, rated at 75 gpm at about 170 ft TDH, and powered by a 5-hp electric motor.

VERMILION

The village of Vermilion (333) installed a public water supply in 1959. One well (No. 1) is in use and another well (No. 2) is available for emergency use. In 1959 there were 87 services, all metered; the average daily pumpage was 2000 gpd. In 1973 there were 91 services, all metered; the average and maximum daily pumpages were 4000 and 10,000 gpd, respectively. The water is in-line aerated, chlorinated, filtered, and fluoridated.

WELL NO. 1, finished in sand and gravel, was completed in August 1956 to a depth of 54.8 ft by the Layne-Western Co., Aurora. The well is located at the treatment plant in the southwest corner of the village, approximately 100 ft N and 800 ft W of the SE corner of Section 11, T13N, R11W. The land surface elevation at the well is approximately 670 ft.

A drillers log of Well No. 1 follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Sandy top soil and soft sandy red clay	9	9
Loose fine yellow-brown sand, fine gravel	2	11
Very sandy brown clay, large stones	3	14
Soft sandy gray clay	7.5	21.5
Loose fine sand, some fine gravel	3.5	25
Loose fine sand to medium gravel	3	28
Very soft gray clay, streaks fine sand	20.5	48.5
Loose fine sand to medium coarse gravel	5	53.5
Soft gray clay, gravel embedded	14.5	68

A 15-in. diameter hole was drilled to a depth of 54.8 ft and under-reamed to an unknown diameter from 48 to 54.8 ft. The well is cased with 8-in. pipe from 1.5 ft above the treatment building floor to a depth of 49.8 ft followed by 5 ft of 8-in. No. 30 slot Cook screen. The annulus between the bore hole and casing-screen assembly is filled with clay from land surface to an unknown depth followed by 2.5 yards of gravel.

A production test was conducted on August 16, 1956, by representatives of the driller, the village, the State Water Survey, and Caldwell-Rhoads Co., Consulting Engineers. After 3 hr of pumping at a rate of 50 gpm, the drawdown was 22.2 ft from a nonpumping water level of 10.0 ft below the top of the casing. The water level recovered to 12.9 ft in 1.7 hr.

The pumping equipment presently installed is a Fairbanks-Morse pump rated at 28 gpm, and powered by a 3-hp electric motor.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. 01604) is for a wa-

ter sample from the well collected September 20, 1971. The iron content in a previous sample was greater.

WELL NO. 1, LABORATORY NO. 01604

		<i>mg/l</i>	<i>me/l</i>			<i>mg/l</i>	<i>me/l</i>
Iron	Fe	0.85	0.03	Silica	SiO ₂	18	
Manganese	Mn	0.0		Fluoride	F	0.4	0.02
Ammonium	NH ₄	1.4	0.08	Nitrate	NO ₃	0.0	
Sodium	Na	28	1.22	Chloride	Cl	24	0.68
Potassium	K	1.0	0.03	Sulfate	SO ₄	45	0.94
Calcium	Ca	91.2	4.55	Alkalinity (as CaCO ₃)		344	6.88
Magnesium	Mg	35.4	2.91	Hardness (as CaCO ₃) 368			
Barium	Ba	0.25		Total dissolved minerals 420			
Copper	Cu	0.0		pH(as rec'd) 7.0			
Cadmium	Cd	0.00		Radioactivity			
Chromium	Cr	0.0		Alpha <i>pc/l</i> 0			
Lead	Pb	0.0		±deviation 1			
Mercury	Hg	<0.0005		Beta <i>pc/l</i> 2			
Nickel	Ni	0.0		±deviation 2			
Silver	Ag	0.0					
Zinc	Zn	0.0					

WELL NO. 2, finished in sand and gravel, was completed in August 1956 to a depth of 55 ft by the Layne-Western Co., Aurora. This well is available for emergency use. The well is located about 260 ft W of Well No. 1, approximately 100 ft N and 1060 ft W of the SE corner of Section 11, T13N, R11W. The land surface elevation at the well is approximately 670 ft.

A drillers log of Well No. 2 follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Sandy red top soil	9	9
Fine yellow sand to fine gravel	2	11
Sandy brown clay	3	14
Soft sandy gray clay	7.5	21.5
Loose fine sand some fine gravel	3.5	25
Loose fine sand to medium gravel	3	28
Very soft gray clay, streaks fine sand	20.5	48.5
Loose fine sand to medium coarse gravel	5	53.5
Soft gray clay gravel embedded	14.5	68
Fairly hard buff clay	9	77
Streaks fine sand, coal	3	80
Fine loose sand to fine gravel (dirty)	2	82
Gravelly gray clay	3	85
Loose fine sand to medium gravel	2	87
Very sandy gray clay gravel embedded	12	99
Hard white and gray lime	4	103

A 15-in. diameter hole was drilled to a depth of 55 ft. The well is cased with 8-in. steel pipe from 1.2 ft above the pumphouse floor to a depth of 50 ft followed by 5 ft of 8-in. No. 30 slot Cook bronze screen. The annulus between the bore hole and casing-screen assembly is filled with clay from 0 to 50 ft and with gravel from 50 to 55 ft.

A production test using Well No. 1 as an observation well was conducted on August 22, 1956, by representatives of the driller, the village, the State Water Survey and Caldwell-Rhoads Co., Consulting Engineers. After 7.5 hr of pumping at varying rates of 23.2 to 27.0 gpm, the drawdown was 25.50 ft from a nonpumping water level of 4.43 ft below land surface. Forty-six min after pumping was stopped, the water level had recovered to 12.73 ft.

The pumping equipment presently installed is a Myers submersible pump rated at 25 gpm.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. 01603) of a sample collected September 20, 1971, showed the water to have a hardness of 388 mg/l, total dissolved minerals of 401 mg/l, and an iron content of 0.9 mg/l. The iron content in a previous sample was greater.