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Public Groundwater Supplies
in Mason County

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PUBLIC GROUNDWATER SUPPLIES IN MASON COUNTY

by Dorothy M. Woller and James P. Gibb

Introduction

This publication presents all available information on production wells used for public groundwater supplies in Mason 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 5 municipalities in Mason 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 Mason County in central Illinois is described generally in Illinois State Geological Survey Circular 248, *Groundwater Geology in East-Central Illinois*, and in more detail in the State Water Survey and Geological Survey Cooperative Ground-Water Report 3, *Preliminary Report on Ground-Water Resources of the Havana Region in West-Central Illinois*. The following brief discussion of geologic conditions in the county is taken largely from these publications. 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.

Sand and gravel deposits underlying Mason County constitute one of the largest underdeveloped aquifers in the state. This area is a wide, bedrock lowland that was formed at the confluence of the ancient Mississippi and Mahomet

Rivers and is now buried beneath a thick mantle of glacial deposits, mainly sand and gravel.

The deposits include ancient stream fill and later glacial outwash that poured down the Illinois River Valley. In the western portion of the county the deposits range in thickness from about 100 to 150 ft and are composed of sand and gravel from land surface to the underlying bedrock units. In the upland areas in the southeastern part of the county the glacial materials range in thickness from about 200 to 300 ft and are composed of sand and gravel at the base overlain by glacial till.

Properly designed and developed wells tapping these deposits should yield 1 million gallons per day with moderate drawdowns. An estimated 350 million gallons per day could potentially be developed from the unconsolidated deposits in the Havana region which includes Mason County.

Pennsylvanian and Mississippian age rocks underlie the glacial deposits in Mason County and are not generally developed as a source for groundwater. Rocks beneath the Mississippian units contain water that is too highly mineralized for most purposes.

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 Easton, Havana, Manito, Mason City, and San Jose. There are presently 11 municipal production and standby wells tapping these aquifers to depths ranging from 78 to 222 ft. Their reported yields range from 60 to 1000 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 1,148,000 gpd in 1972. Past and present analyses of water they produce indicate that the iron content ranges from 0.0 to 4.6 mg/l, and the hardness from 140 to 341 mg/l. Groundwater for the municipal supplies of Easton and San Jose is aerated, filtered, chlorinated, and fluoridated. The water for Havana, Manito, and Mason City is fluoridated.

Case histories of large-capacity wells in the Mason County area reveal a rapid decline in well yields, often resulting in costly well repairs and eventual well abandonment. This deterioration can often be traced to overpumping in many of the wells. Overpumping in this instance refers to pumping rates high enough to cause migration of fine-grained material from the aquifer toward the well face, thereby lowering the permeability of the aquifer in the immediate vicinity of the well and subsequent large reductions in well yields. In some cases the entrance velocities become high enough to carry fine sand through the well screen. It is important that wells be properly designed to prevent the entrance of fine material into wells and that pumping rates be limited to those that will not cause rapid deterioration in yield.

Format

In this publication the descriptions of public groundwater supplies are presented in alphabetical order by place name.

The U. S. Census of population for 1970 is given at the beginning of each description.

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.*

When available sample study logs by the Illinois State Geological Survey are presented. When these are not available, drillers logs are used as reported. Commonly used drillers terms such as clay, silt, or pebbly clay generally are synonymous with the glacial tills tabulated by the State Geological Survey.

The screen sizes given in this publication are for continuous slot 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

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

EASTON

The village of Easton (386) installed a public water supply in 1959. Two wells are in use. In 1960 there were 92 services, all metered; the estimated average daily pumpage was 12,000 gpd. In 1972 there were 182 services, all metered; the estimated average and maximum daily pumpages were 23,000 and 40,000 gpd, respectively. The water is chlorinated, fluoridated, aerated, and filtered.

WELL NO. 1, finished in sand and gravel, was completed in March 1960 to a depth of 135 ft by William H. Hatfield, Easton. The well is located in the treatment plant at the northwest corner of Park and Second Sts., approximately 15 ft N and 800 ft E of the SW corner of Section 25, T21N, R7W. The land surface elevation at the well is approximately 510 ft.

A drillers log of Well No. 1 follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Sandy loam	15	15
Fine sand and loam	10	25
Fine silty sand	15	40
Fine sand	25	65
Sand	15	80
Sand and fine gravel	15	95
Sand and gravel	15	110
Gravel	25	135

An 8-in. diameter hole was drilled to a depth of 135 ft. The well is cased with 8-in. steel pipe from 1 ft above the pumphouse floor to a depth of 125 ft followed by 10 ft of 8-in. No. 25 slot Cook screen.

On March 21, 1960, after 3.5 hr of pumping at rates of 110 to 300 gpm, the drawdown was 7.8 ft from a nonpumping water level of 14.5 ft below land surface.

A production test using one observation well was conducted by the State Water Survey on October 5, 1960. The well reportedly produced 60 gpm for 7.1 hr with a drawdown of 1.97 ft from a nonpumping water level of 14.45 ft below the pump base.

The pumping equipment presently installed is a Deming turbine pump set at 50 ft, rated at 150 gpm, and powered by a 5-hp 1800 rpm U. S. electric motor.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B105997) of a sample collected December 5, 1973, after pumping for 30 min at 150 gpm, showed the water to have a hardness of 267 mg/l, total dissolved minerals of 289 mg/l, and an iron content of 1.6 mg/l.

WELL NO. 2, finished in sand and gravel, was completed in August 1971 to a depth of 138 ft by E. C. Baker & Sons, Sigel. The well is located about 10 ft SE of Well No. 1, approximately 9 ft N and 820 ft E of the SW corner of Section

25, T21N, R7W. The land surface elevation at the well is approximately 510 ft.

A drillers log of Well No. 2 follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Soil	5	5
Yellow loam	13	18
Yellow sandy clay	3	21
Blue sand loam	6	27
Sand with wood and coal	13	40
Sand, fine to medium	30	70
Sand, coarse	50	120
Sand, coarse, gravel	18	138
Sand, fine to medium	4	142

An 8-in. diameter hole was drilled to a depth of 138 ft. The well is cased with 8-in. steel pipe from 1 ft above land surface to a depth of 128 ft followed by 10 ft of 8-in. No. 30 slot Cook stainless steel screen.

A production test using one observation well was conducted on August 30, 1971, by representatives of the driller, the village, the State Water Survey, and Crawford, Murphy & Tilly, Consulting Engineers. After 3 hr of pumping at a rate of 150 gpm, the drawdown was 3.91 ft from a nonpumping water level of 11.96 ft below land surface. Thirty min after pumping was stopped, the water level had recovered to 12.01 ft.

The pumping equipment presently installed consists of a 5-hp 1730 rpm U. S. electric motor (Model No. F-2965-00-271, Serial No. 7777215), a Crane Deming turbine pump (Model No. 4700, Serial No. T-71262) set at 50 ft, rated at 150 gpm at about 42 ft TDH, and 50 ft of 4-in. column pipe. The well is equipped with 50 ft of airline.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B105804) is for a water sample from the well collected January 8, 1973, after 45 min of pumping at 150 gpm.

WELL NO. 2, LABORATORY NO. B105804

		<i>mg/l</i>	<i>me/l</i>		<i>mg/l</i>	<i>me/l</i>
Iron	Fe	1.3	0.05	Silica	SiO ₂	20
Manganese	Mn	0.22	0.01	Fluoride	F	0.1
Ammonium	NH ₄	0.1	0.01	Boron	B	0.1
Sodium	Na	6	0.26	Nitrate	NO ₃	0
Potassium	K	1.2	0.03	Chloride	Cl	4
Calcium	Ca	64	3.19	Sulfate	SO ₄	30
Magnesium	Mg	31	2.55	Alkalinity (as CaCO ₃)	256	5.12
Arsenic	As	0.00		Hardness (as CaCO ₃)	287	
Barium	Ba	0.1		Total dissolved minerals	316	
Copper	Cu	0.00		pH (as rec'd)	8.4	
Cadmium	Cd	0.00		Radioactivity		
Chromium	Cr	0.00		Alpha <i>pc/l</i>	0.0	
Lead	Pb	0.00		± deviation	0.6	
Mercury	Hg	0.0000		Beta <i>pc/l</i>	6.8	
Nickel	Ni	0.00		ideviation	1.7	
Selenium	Se	0.00				
Silver	Ag	0.00				
Zinc	Zn	0.0				

HAVANA

The city of Havana (4376) installed a public water supply in 1889. Two wells (Nos. 2 and 4) are in use. In 1950 there were 1600 services, all metered; the average daily pumpage was 558,000 gpd. In 1972 there were 1660 services, all metered; the estimated average and maximum daily pumpages were 700,000 and 1,200,000 gpd, respectively. The water is fluoridated.

Water was initially obtained from 10 wells completed in 1889 to depths of 72 ft. The wells were located at the waterworks pumping station two blocks east of the Court House Square on the north side of Main St., approximately 1500 ft S and 850 ft W of the NE corner of Section 1, T21N, R9W. Two of the wells were located 12 ft apart within the pumping station. The other eight were located in two pits just outside the station. All 10 of the wells were within 60 ft of each other. The wells were cased with 6-in. pipe from the floor of the 15-ft deep by 16-ft diameter pits to a depth of 52 ft followed by 20 ft lengths of Cook screen. In November 1914 the nonpumping water level was reported to be 30 ft below land surface. All of these wells were abandoned and sealed prior to 1938.

WELL NO. 1, finished in sand and gravel, was completed in 1930 to a depth of 85 ft by the Thorpe Concrete Well Co., Alton. This well was abandoned about 1965 and sealed in 1968. The well was located 2 blocks east of the business district on High and Main Sts., approximately 1500 ft S and 350 ft W of the NE corner of Section 1, T21N, R9W. The land surface elevation at the well is approximately 468 ft.

The well was cased with 26-in. ID by 36-in. OD blank concrete pipe from 1.3 ft above land surface to a depth of 65 ft. A porous concrete screen of the same size extended from 65 to 85 ft.

In April 1938, the nonpumping water level was reported to be 33 ft below land surface.

A mineral analysis of a sample (Lab. No. 83962) collected July 28, 1938, showed the water to have a hardness of 197 mg/l, total dissolved minerals of 232 mg/l, and an iron content of 0.07 mg/l.

WELL NO. 2, finished in sand and gravel, was completed in 1942 to a depth of 85 ft (originally drilled to 90 ft) by C. B. Layman, Havana. The well is located in the east section of the pump station directly over the old coal bin, approximately 1530 ft S and 330 ft W of the NE corner of Section 1, T21N, R9W. The land surface elevation at the well is approximately 468 ft.

A 12-in. diameter hole was drilled to a depth of 85 ft. The well is cased with 12-in. steel pipe from 1.2 ft above the pump station floor to a depth of 70 ft followed by 15 ft of 12-in. No. 40 slot Cook screen.

In February 1948, the well reportedly produced 950 gpm with a drawdown of 7 ft from a nonpumping water level of 22 ft below the pump base.

In 1962 and 1966, this well was cleaned and acidized by the Chris Ebert Co., Washington. The original well capacity was reportedly restored each time.

The pumping equipment presently installed is a 4-stage Fairbanks-Morse vertical turbine pump rated at 1000 gpm and powered by a 60-hp 1755 rpm Fairbanks-Morse electric motor.

A mineral analysis of a sample (Lab. No. 113476) collected February 16, 1948, after pumping for 15 min, showed the water to have a hardness of 186 mg/l, total dissolved minerals of 232 mg/l, and an iron content of 0.2 mg/l.

WELL NO. 3, finished in sand and gravel, was completed in 1952 to a depth of 113 ft by William M. Ebert, Washington. This well was abandoned about 1965 and sealed in 1968. The well was located at the NE corner of North Pearl and East Main Sts., approximately 1350 ft S and 800 ft W of the NE corner of Section 1, T21N, R9W. The land surface elevation at the well is approximately 490 ft.

A 12-in. diameter hole was drilled to a depth of 113 ft. The well was cased with 12-in. pipe from 1.5 ft above the pumphouse floor to a depth of 78 ft followed by 35 ft of 12-in. Johnson screen. The screened section from top to bottom consisted of 10 ft of No. 40 slot, 3 ft of No. 50 slot, and 22 ft of No. 20 slot.

Upon completion, the well reportedly produced 635 gpm for 5 hr with a drawdown of 21.5 ft from a nonpumping water level of 55.0 ft.

A mineral analysis of a sample (Lab. No. 130814) collected December 12, 1952, after pumping for 5 hr at 635 gpm, showed the water to have a hardness of 177 mg/l, total dissolved minerals of 197 mg/l, and an iron content of 0.4 mg/l.

WELL NO. 4, finished in sand and gravel, was completed in July 1960 to a depth of 78 ft by the Chris Ebert Co., Washington. The well is located about 75 ft W of Well No. 2 in a building connected to the main pumping station, approximately 1530 ft S and 405 ft W of the NE corner of Section 1, T21N, R9W. The land surface elevation at the well is approximately 470 ft.

The well is cased with 12-in. pipe from 1.5 ft above the pumphouse floor to a depth of 58 ft followed by 20 ft of 12-in. No. 30 slot Johnson screen.

Upon completion, the well reportedly produced from 900 to 1000 gpm for 8 hr with a drawdown of 26 ft from a nonpumping water level of 24 ft below land surface.

In 1966, this well was acidized by the Chris Ebert Co., Washington. The original well capacity was reportedly restored.

The pumping equipment presently installed is a Fairbanks-Morse Pomona vertical turbine pump set at 54 ft, rated at 1000 gpm, and powered by a 60-hp Fairbanks-Morse electric motor.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B105916) is for a water sample from the well collected January 10, 1973, after 45 min of pumping at 650 gpm.

WELL NO. 4, LABORATORY NO. B105916						
		mg/l	me/l		mg/l	me/l
Iron	Fe	0.16	0.01	Silica	SiO ₂	16
Manganese	Mn	0.14	0.00	Fluoride	F	0.0
Ammonium	NH ₄	0		Boron	B	0.1
Sodium	Na	6	0.26	Nitrate	NO ₃	9.7
Potassium	K	1.1	0.03	Chloride	Cl	8
Calcium	Ca	52	2.60	Sulfate	SO ₄	45
Magnesium	Mg	16.5	1.36	Alkalinity (as CaCO ₃)		140
				Hardness (as CaCO ₃)		197
Arsenic	As	0.00		Total dissolved		
Barium	Ba	0.0		minerals		240
Copper	Cu	0.00		pH (as rec'd)		8.2
Cadmium	Cd	0.00		Radioactivity		
Chromium	Cr	0.00		Alpha pc/l		0.9
Lead	Pb	0.00		± deviation		0.8
Mercury	Hg	0.0000		Beta pc/l		2.9
Nickel	Ni	0.0		± deviation		1.3
Selenium	Se	0.00				
Silver	Ag	0.00				
Zinc	Zn	0.0				

WELL NO. 5, finished in sand and gravel, was completed in September 1974 to a depth of 96 ft by Luhr Bros., Inc., Columbia. As of October 1974, this well had not been placed in service. The well is located near the eastern edge of the city, approximately 2170 ft S and 175 ft E of the NW corner of Section 6, T21N, R8W. The land surface elevation at the well is approximately 470 ft.

A 32-in. diameter hole was drilled to a depth of 96.5 ft. The well is cased with 12-in. pipe from 3 ft above land surface to a depth of 46 ft followed by 50 ft of 12-in. Johnson Everdur screen. The screened section from top to bottom consists of 9.8 ft of No. 50 slot, 33.8 ft of No. 20 slot, and 6.4 ft of No. 15 slot. The annulus between the bore hole

and casing-screen assembly is filled with concrete from 0 to 17 ft and with No. 1 Northern gravel from 17 to 96 ft.

A drillers log of Well No. 5 follows:

Strata	Thickness (ft)	Depth (ft)
Sand, brown, fine	10	10
Sand, tan, fine	5	15
Sand, tan, medium fine	5	20
Sand, tan, fine	5	25
Sand, tan, medium	5	30
Sand, tan, fine	5	35
Sand, tan, medium fine	10	45
Sand, gray, coarse	5	50
Sand, gray, very coarse	5	55
Sand, gray, coarse	10	65
Sand, gray, medium coarse	10	75
Sand, gray, medium	20	95
Sand, gray, medium with cobbles to 3 in. size	1.5	96.5

A production test was conducted on September 19, 1974, by representatives of the driller, the city, the State Water Survey, and Casler, Houser, Hutchison, Inc., Consulting Engineers. After 3 hr of pumping at rates ranging from 1130 to 966 gpm, the final drawdown was 10.16 ft from a nonpumping water level of 19.74 ft below land surface. Thirty min after pumping was stopped, the water level had recovered to 20.32 ft. On the basis of the production test data, it was estimated that this well would yield 1000 gpm (1,440,000 gpd) on a long-term basis.

As of October 1974, the permanent pump had not been installed.

A partial analysis of a sample (Lab. No. 196914) collected during the initial production test, after pumping for 3 hr at 1000 gpm, showed the water to have a hardness of 162 mg/l, total dissolved minerals of 210 mg/l, and an iron content of 0.0 mg/l.

MANITO

The village of Manito (1334) installed a public water supply in 1937. Two wells (Nos. 2 and 3) are in use and another well (No. 1) is available for emergency use. In 1949 there were 230 services, all metered; the estimated average daily pumpage was 40,000 gpd. In 1972 there were 520 services, 12 metered; the estimated average and maximum daily pumpages were 150,000 and 250,000 gpd, respectively. The water is fluoridated.

WELL NO. 1, finished in sand and gravel, was completed in July 1937 to a depth of 81 ft by Chris Ebert, Washington. This well is available for emergency use. The well is located at the southeast corner of Main and Broadway Sts. inside the treatment plant at the base of the elevated tank, approximately 2300 ft N and 1650 ft W of the SE corner of Section 21, T23N, R6W. The land surface elevation at the well is approximately 500 ft.

A 10-in. diameter hole was drilled to a depth of 81 ft. The well is cased with 10-in. pipe to a depth of 61 ft followed by 20 ft of 10-in. Johnson brass screen. The screened section from top to bottom consists of 4 ft of No. 25 slot, 7 ft of No. 12 slot, and 9 ft of No. 25 slot.

A production test was conducted by the State Water Survey on July 15-16, 1937. After 24 hr of pumping at a rate of 255 gpm, the drawdown was 7.0 ft from a nonpumping water level of 33.5 ft below the top of the casing.

On February 11, 1948, the well reportedly produced 120 gpm for 40 min with a drawdown of 2 ft from an original airline reading of 10 ft. The length of the airline was unknown.

The pumping equipment presently installed consists of a 7 1/2-hp 1740 rpm Fairbanks-Morse electric motor (No. 3 32477), a 6-in., 7-stage Fairbanks-Morse turbine pump (No. 6920) rated at 120 gpm, and 30 ft of 5-in. column pipe.

A mineral analysis of a sample (Lab. No. 113466) collected February 11, 1948, after pumping for 40 min at 120 gpm, showed the water to have a hardness of 284 mg/l, total dissolved minerals of 349 mg/l, and an iron content of 0.1 mg/l.

WELL NO. 2, finished in sand and gravel, was constructed in October 1950 to a depth of 84 ft by Forrest Ebert, Washington, and deepened in August 1955 to a depth of 93 ft by the M. Ebert Co., Washington. The well is located about 10 ft NW of Well No. 1, approximately 2310 ft N and 1660 ft W of the SE corner of Section 21, T23N, R6W. The land surface elevation at the well is approximately 500 ft.

A 10-in. diameter hole was drilled to a depth of 93 ft. The well is cased with 10-in. black steel pipe from 0.5 ft above land surface to a depth of 72 ft and equipped with 21.9 ft (21 ft exposed) of 10-in. Johnson Everdur screen. The screened section consists of 1.9 ft of blank pipe, 2 ft of No. 20 slot, 2 ft of No. 30 slot, 8 ft of No. 50 slot, and 8 ft of No. 25 slot.

After deepening, the well was acidized in August 1955. The driller reported that after 4 hr of pumping at a rate of 152 gpm, the drawdown was 5 ft from a nonpumping water level of 37 ft.

The well was again acidized in March 1964 by the M. Ebert Co., Washington. The well reportedly produced 150 gpm with a drawdown of 12 ft from a nonpumping water level of 23 ft.

The pumping equipment presently installed consists of a 10-hp 1760 rpm electric motor, a Fairbanks-Morse Pomona turbine pump set at 78 ft, rated at 150 gpm, and 60 ft of 4-in. column pipe. A 13.5-ft section of 4-in. suction pipe is attached to the pump intake. The well is equipped with 63 ft of airline.

A mineral analysis of a sample (Lab. No. 152611) collected June 28, 1960, showed the water to have a hardness of 255 mg/l, total dissolved minerals of 320 mg/l, and an iron content of 1.1 mg/l.

WELL NO. 3, finished in sand and gravel, was completed in May 1967 to a depth of 100 ft by the M. Ebert Co., Washington. The well is located 30 ft S of State St. and about 130 ft E of Washington St. in the village park, approximately 700 ft N and 2100 ft W of the SE corner of Section 21, T23N, R6W. The land surface elevation at the well is approximately 495 ft.

A 12-in. diameter hole was drilled to a depth of 100 ft. The well is equipped with a 12-in. Whitewater pitless adapter from 1.7 ft above land surface to 3.5 ft and cased with 12-in. black steel pipe to a depth of 80 ft followed by 20 ft of

12-in. Johnson Everdur screen. The screened section from top to bottom consists of 3 ft of No. 12 slot, 5 ft of No. 20 slot, 6 ft of No. 28 slot, and 6 ft of No. 18 slot.

A drillers log of Well No. 3 follows:

Strata	Thickness (ft)	Depth (ft)
Fill	1	1
Sandy loam	3	4
Brown coarse sand	11	15
Yellow sand and medium gravel	25	40
Gray sand, traces of fine gravel	5	45
Gray sand	10	55
Fine gray sand	5	60
Gray sand	5	65
Gray sand, trace of fine gravel	5	70
Fine to medium gray sand	9.5	79.5
All grades sand, few stones	6.5	86
All grades sand, fine gravel	6	92
All grades sand	8	100

A production test was conducted on May 11, 1967, by representatives of the driller, the State Water Survey, and J. H. Cordes, Engineer. After 2 hr of pumping at rates of 353 to 369 gpm, the final drawdown was 7.55 ft from a nonpumping water level of 17.54 ft below land surface. Twenty-five min after pumping was stopped, the water level had recovered to 17.59 ft. On the basis of the production test data, it was estimated that this well should yield 350 gpm (504,000 gpd) on a long-term basis.

The pumping equipment presently installed is a Berkeley submersible pump (Model No. 6S2AH5) set at 71 ft, rated at 300 gpm at about 200 ft TDH, and powered by a 20-hp U. S. electric motor.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B105913) is for a water sample from the well collected November 4, 1973, after pumping at 325 gpm.

WELL NO. 3, LABORATORY NO. B105913

	mg/l	me/l	mg/l	me/l			
Iron	Fe	0.80	Silica	SiO ₂	20		
Manganese	Mn	0.12	Fluoride	F	0.2	0.01	
Ammonium	NH ₄	0.1	Boron	B	0.3		
Sodium	Na	10	Nitrate	NO ₃	0.0	0.00	
Potassium	K	0.7	Chloride	Cl	16	0.4	0.5
Calcium	Ca	52	Sulfate	SO ₄	35	0.73	
Magnesium	Mg	21	Alkalinity (as CaCO ₃)	176	3.52		
Arsenic	As	0.00					
Barium	Ba	0.0	Hardness (as CaCO ₃)	217	4.34		
Copper	Cu	0.00					
Cadmium	Cd	0.00	Total dissolved minerals		330		
Chromium	Cr	0.00					
Lead	Pb	0.00					
Mercury	Hg	0.0000	pH (as rec'd)	8.1			
Nickel	Ni	0.0	Radioactivity				
Selenium	Se	0.00	Alpha pc/l	0.7			
Silver	Ag	0.00	±deviation	0.5			
Cyanide	CN	0.00	Beta pc/l	2.0			
Zinc	Zn	0.00	±deviation	0.9			

MASON CITY

The city of Mason City (2611) installed a public water supply in 1889. Two wells (Nos. 3 and 4) are in use. In 1949 there were 300 services, 15 percent metered; the estimated average and maximum daily pumpages were 125,000 and 135,000 gpd, respectively. In 1972 there were 1000 services, all but 19 are metered; the average and maximum daily pumpages were 225,000 and 290,000 gpd, respectively. The water is fluoridated.

WELL NO. 1, finished in sand and gravel, was completed in 1889 to a depth of 200 ft by W. Turner and J. W. Fielder, Mason City. This well was abandoned in 1925 and sealed in 1952. The well was located at the pumping station on the east side of Tonica St. south of High St., approximately 1350 ft S and 300 ft E of the NW corner of Section 8, T20N, R5W. The land surface elevation at the well is approximately 575 ft.

A drillers log of Well No. 1 follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Loam	15	15
Sand and water	1	16
Blue clay	20	36
Sand	65	101
Sand and gravel	20	121
Fine sand	14	135
Fine sand and gravel	55	190
Gravel	10	200

The well was cased with 10-in. pipe to a depth of 80 ft, 8-in. pipe from 80 ft to a depth of 135 ft, and 6-in. pipe from 135 ft to a depth of 180 ft followed by 20 ft of 6-in. Cook screen.

In November 1914, the nonpumping water level was reported to be 65 ft below land surface.

WELL NO. 2, finished in sand and gravel, was completed in 1895 to a depth of 200 ft by J. D. Mount, Mason City. This well was abandoned in 1940 and sealed in 1952. The well was located within the pump station about 20 ft NE of Well No. 1, approximately 1340 ft S and 310 ft E of the NW corner of Section 8, T20N, R5W. The land surface elevation at the well is approximately 575 ft.

A correlated drillers log of Well No. 2 furnished by the State Geological Survey follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
PLEISTOCENE SYSTEM		
Loam	15	15
Sand	1	16
Blue clay	20	36
Sand	65	101
Sand and gravel	99	200

The well was cased with 10-in. pipe to a depth of 80 ft, 8-in. pipe from 80 ft to a depth of 135 ft, and 6-in. pipe from 135 ft to a depth of 180 ft followed by 20 ft of 6-in. Cook screen.

In November 1914, the nonpumping water level was reported to be about 65 ft below land surface.

WELL NO. 3, finished in sand and gravel, was completed in 1916 to a depth of 197 ft by C. P. Brant, Indianapolis, Ind. The well is located in the south end of the pumping station about 20 ft SE of Well No. 2, approximately 1350 ft S and 320 ft E of the NW corner of Section 8, T20N, R5W. The land surface elevation at the well is approximately 578 ft.

A 12-in. diameter hole was drilled to a depth of 197 ft. The well is cased with 12-in. pipe from 6 in. below floor level to a depth of 185 ft followed by 12 ft of 12-in. No. 30 slot Cook screen.

In November 1919 and February 1948, nonpumping water levels were reported to be 60 and 54 ft below the pump base, respectively.

On December 27, 1957, this well was acidized and treated with polyphosphate.

The pumping equipment presently installed consists of a 15-hp 1750 rpm Westinghouse electric motor (Serial No. 5042), an 8-in., 8-stage Pomona turbine pump (No. SC579) rated at 250 gpm at about 184 ft head, and 80 ft of 6-in. column pipe. A 10-ft section of 5-in. suction pipe is attached to the pump intake. The well is equipped with 80 ft of airline.

A mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B102411) of a sample collected August 26, 1974, after pumping for 1 hr at 155 gpm, showed the water to have a hardness of 303 mg/l, total dissolved minerals of 324 mg/l, and an iron content of 1.6 mg/l.

WELL NO. 4, finished in sand and gravel, was completed in 1928 to a depth of 222 ft by Baureisen Drilling Co., Chicago. The well is located in the north end of the pumping station about 40 ft NE of Well No. 3, approximately 1330 ft S and 340 ft E of the NW corner of Section 8, T20N, R5W. The land surface elevation at the well is approximately 575 ft.

A sample study log of Well No. 4 furnished by the State Geological Survey follows:

<i>Strata</i>	<i>Thickness (ft)</i>	<i>Depth (ft)</i>
Soil, cinders	5	5
Sand, fine, brown	35	40
Silt, noncalcareous, brown	5	45
Till, silty, brown, noncalcareous	5	50
Sand, medium to very coarse	5	55
Sand, very coarse, with granule gravel, very dirty	10	65
No samples	10	75
Till, calcareous, yellowish brown	10	85
Sand, fine to medium, calcareous	5	90
No samples	105	195
Sand, very fine to fine, brown	4	199
Sand, very coarse, with granule gravel	11	210
Sand, medium to coarse	10	220
Interval not studied	2	222

A 12-in. diameter hole was drilled to a depth of 222 ft. The well is cased with 12-in. pipe from 6 in. below floor level to a depth of 210 ft followed by 12 ft of 12-in. Cook screen.

On April 13, 1938, and February 16, 1948, nonpumping water levels below the pump base were reported to be 52 and 67 ft, respectively.

On December 27, 1957, this well was acidized and treated with polyphosphate. This well was acidized again in June 1963.

The pumping equipment presently installed consists of a 15-hp 1700 rpm Westinghouse electric motor (Serial No. 1737), an 8-in., 8-stage Pomona turbine pump (No. SC2346) rated at 250 gpm at about 184 ft head, and 80 ft of 6-in. column pipe. A 10-ft section of 5-in. suction pipe is attached to the pump intake. The well is equipped with 105 ft of airline.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B106025) is for a water sample from the well collected January 15, 1973,

after 1 hr of pumping at 200 gpm.

WELL NO. 4, LABORATORY NO. B106025

		mg/l		me/l		mg/l	me/l
Iron	Fe	0.18	0.01	Silica	SiO ₂	20	
Manganese	Mn	0.44	0.02	Fluoride	F	0.2	0.01
Ammonium	NH ₄	0.6	0.03	Boron	B	0.1	
Sodium	Na	4	0.17	Nitrate	NO ₃	0.9	0.01
Potassium	K	1.1	0.03	Chloride	Cl	2	0.06
Calcium	Ca	68	3.40	Sulfate	SO ₄	0	
Magnesium	Mg	29	2.38	Alkalinity (as CaCO ₃)		276	5.52
Arsenic	As	0.00		Hardness (as CaCO ₃)		289	
Barium	Ba	0.0		Total dissolved minerals		276	
Copper	Cu	0.00		pH (as rec'd)		7.8	
Cadmium	Cd	0.00		Radioactivity			
Chromium	Cr	0.00		Alpha pc/l		1.2	
Lead	Pb	0.00		± deviation		1.2	
Mercury	Hg	0.0000		Beta pc/l		2.7	
Nickel	Ni	0.0		± deviation		1.6	
Selenium	Se	0.00					
Silver	Ag	0.00					
Zinc	Zn	0.0					

SAN JOSE

The village of San Jose (681) installed a public water supply in 1885. One well (No. 4) is in use and another well (No. 3) is available for emergency use. In 1949 there were 220 services, all metered; the estimated average daily pumpage was 18,000 gpd. In 1972 there were 254 services, all metered; the estimated average and maximum daily pumpages were 50,000 and 68,000 gpd, respectively. The water is aerated, filtered, chlorinated, and fluoridated.

WELL NO. 1, finished in sand and gravel, was constructed in 1884 to an unknown depth, and reportedly deepened in 1911 to a depth of 105 ft. This well was abandoned and sealed in 1921. The well was located at the pumping station south of Arch St. and west of Second St., approximately 500 ft S and 500 ft W of the NE corner of Section 1, T21N, R5W. The land surface elevation at the well is approximately 595 ft.

The well was cased with 4-in. pipe to a depth of 85 ft followed by 20 ft of 4-in. Cook screen.

In 1915, the nonpumping water level was reported to be 80 ft below land surface.

WELL NO. 2, finished in sand and gravel, was completed in 1917 to a depth of 101 ft by H. B. Smith, San Jose. This well was abandoned and sealed between 1958 and 1961. The well was located in the main pumping station about 20 ft east of Well No. 1, approximately 500 ft S and 480 ft W of the NE corner of Section 1, T21N, R5W. The land surface elevation at the well is approximately 595 ft.

A drillers log of Well No. 2 follows:

Strata	Thickness (ft)	Depth (ft)
Yellow loam	20	20
Yellow clay	25	45
Red dry gravel	20	65
Red sand	2.6	91
Red coarse gravel	10	101

A 6-in. diameter hole was drilled to a depth of 101 ft. The well was cased with 6-in. pipe to a depth of 91 ft followed by 10 ft of 6-in. No. 10 slot Cook screen. This well was reported to be cleaned and recased about every 12 years.

In July 1938, the nonpumping water level was reported to be 70 ft below land surface.

A mineral analysis of a sample (Lab. No. 83955) collected July 28, 1938, showed the water to have a hardness of 409 mg/l, total dissolved minerals of 494 mg/l, and an iron content of 0.34 mg/l.

WELL NO. 3, finished in sand and gravel, was completed in 1921 to a depth of 103 ft by H. B. Smith, San Jose. This well is available for emergency use. The well is located in the main pumping station about 10 ft NE of Well No. 2, approximately 490 ft S and 470 ft W of the NE corner of Section 1, T21N, R5W. The land surface elevation at the well is approximately 595 ft.

A drillers log of Well No. 3 follows:

Strata	Thickness (ft)	Depth (ft)
Yellow loam	20	20
Yellow clay	25	45
Red dry gravel	20	65
Red sand	2.8	93
Coarse red gravel	10	103

A 6-in. diameter hole was drilled to a depth of 103 ft. The well is cased with 6-in. pipe to a depth of 95 ft followed by 8 ft of 6-in. No. 10 slot Cook screen. This well is reported to be cleaned and recased about every 12 years.

In July 1938, the nonpumping water level was reported to be about 70 ft below land surface.

The pumping equipment presently installed is a 6-in. single-acting Cook cylinder pump rated at 60 gpm, and powered by a 10-hp 860 rpm Century electric motor.

WELL NO. 4, finished in sand and gravel, was constructed

in 1951 to a depth of 101 ft, and reportedly deepened in May 1957 to a depth of 186 ft by the Chris Ebert Co., Washington. The well is located about 15 ft ESE of Well No. 3, approximately 495 ft S and 455 ft W of the NE corner of Section 1, T21N, R5W. The land surface elevation at the well is approximately 595 ft.

A drillers log of Well No. 4 follows:

Strata	Thickness (ft)	Depth (ft)
Loam and clay	35	35
Dry red sand and gravel	40	75
Red sand (water bearing)	26	101
Red sand and fine gravel	73	174
Sand and gravel	12	186

The well is cased with 6-in. pipe from 2 ft above land surface to a depth of about 174 ft followed by 12 ft of 6-in. screen.

The pumping equipment presently installed is a Fairbanks-Morse Pomona turbine pump (Serial No. AT-1856) rated at 150 gpm, and powered by a 15-hp 1755 rpm Fairbanks-Morse electric motor.

The following mineral analysis made by the Illinois Environmental Protection Agency (Lab. No. B101542) is for a water sample from the well collected August 14, 1973, after pumping at 70 gpm.

WELL NO. 4, LABORATORY NO. B10154 2

	mg/l	me/l	mg/l	me/l
Iron	Fe 3.7		Silica	SiO ₂ 24
Manganese	Mn 0.06		Fluoride	F 0.2 0.01
Ammonium	NH ₄ 0.4	0.02	Boron	B 0.3
Sodium	Na 6	0.26	Nitrate	NO ₃ 0.9 0.01
Potassium	K 0.8	0.02	Chloride	Cl 2 0.06
Calcium	Ca 74	3.69	Sulfate	SO ₄ 24 0.50
Magnesium	Mg 35	2.88	Alkalinity (as CaCO ₃)	306 6.12
Arsenic	As 0.01		Hardness (as CaCO ₃)	329 6.58
Barium	Ba 0.2		Total dissolved minerals	395
Copper	Cu 0.00		pH (as rec'd)	7.8
Cadmium	Cd 0.00		Radioactivity	
Chromium	Cr 0.00		Alpha	pc/l 0.0
Lead	Pb 0.00		±deviation	0.7
Mercury	Hg 0.0000		Beta	pc/l 0.0
Nickel	Ni 0.0		±deviation	1.3
Selenium	Se 0.00			
Silver	Ag 0.00			
Zinc	Zn 0.08			