



Illinois Department of Natural Resources

One Natural Resources Way • Springfield, Illinois 62702-1271
http://dnr.state.il.us

Rod R. Blagojevich, Governor

Sam Flood, Acting Director

Office of Water Resources • 36 S. Wabash Avenue, Room 1415
Chicago, IL 60603-2921 • OFC: 312/793-3123 • FAX: 312/793-5968

2008 Annual Water Use Audit Form (LMO-2)

This form must be completed by all Category IA and IIB Permittees for each annual water use accounting year running from October 1st through September 30th. This form must be submitted to the Department by January 5, 2009.

Section I - General Information

Name, address and phone number of Permittee:

City of Chicago
Department of Water Management
1000 E. Ohio Street
Chicago, IL 60611

County Cook

Name, address and phone number of the contact person for the Permittee:

John F. Spatz
312-744-7001

e-mail address _____

Authorized Official John F. Spatz

Title Commissioner

Date February 17, 2009

Please provide the following leak survey information and population estimates for the last year.

Results and recommendations of leak surveys conducted on the water distribution system including progress made in leak repair. (attach to back of form)

Population 2,896,000 Number of existing households 1,153,000

The Illinois Department of Natural Resources is requesting disclosure of information that is necessary to accomplish the statutory purpose as outlined under Chapter 19, Section 120.2 of the Illinois Revised Statutes. Disclosure of this information is required. Failure to provide any information will result in this form not being processed. This form has been approved by the Forms Management Center, Central Management Services.

Section II - Water Use Audit

Enter the amount of water pumped and utilized for each item shown below. All amounts entered in this section must be in units of million gallons per day (MGD) rounded off to 3 decimal places to the right of the decimal. Conversion calculations are provided for your use in Section IV to convert other commonly used units to MGD.

A. Pumpage Data

Water bought or received from the following distribution systems:

1. Lake Michigan Pumpage	833.099	MGD
2. Shallow Aquifer Pumpage	0	MGD
3. Deep Aquifer Pumpage	0	MGD
4. Total Pumpage (Add lines 1, 2 & 3)	833.099	MGD
5. Water Treatment Use	1.863	MGD
6. Gross Annual Pumpage (subtract line 5 from line 4)	831.236	MGD

Water sold or provided to any other distribution systems (enter the name of each system and the amount sold or provided to that system on lines 7 through 12). If additional lines are required, attach an additional sheet listing each system and amount.

7. _____	304.460	MGD
8. _____		MGD
9. _____		MGD
10. _____		MGD
11. _____		MGD
12. _____		MGD
13. Total (add lines 7-12 and any additional amounts)	304.460	MGD
14. Net Annual Pumpage (subtract line 13 from line 6)	526.776	MGD

B. Uses	Metered	Unmetered.....	Total
15. Residential	75.802	232.046	307.848 MGD
16. Commercial and Manufacturing	132.366	2.412	134.778 MGD
17. Municipal	16.917	0.000	16.917 MGD
18. Construction			0.000 MGD
19. Total Uses (add Total lines 15 through 18)			459.543 MGD
20. Percentage of Total Use to Net Annual Pumpage (divide line 19 by line 14 and multiply by 100)			87.24 %

C. Hydrant Uses

21. Firefighting and Training	2.634	MGD
22. Water Main Flushing	0.400	MGD
23. Sewer Cleaning	0.100	MGD
24. Street Cleaning	0.100	MGD
25. Construction	2.634	MGD
*26. Other (attach explanation)	5.268	MGD
27. Total Hydrant Use (add lines 21 through 26)	11.136	MGD

* open Hydrant

Section II - Water Use Audit (continued)

- 28. Percentage of Hydrant Use to Net Annual Pumpage
(divide line 27 by line 14 and multiply by 100) 2.11 %
- 29. Department Requirement for Hydrant Use 1.0 %
- 30. Excessive hydrant use (subtract line 29 from line 28). If the percentage is
greater than 0.0, attach explanation. [see Rule 730.307(e)] 1.11 %

D. Unavoidable Leakage and Unaccounted for Flow

- 31. Maximum Unavoidable Leakage (Do worksheet in Section III;
enter amount from line 10 of the worksheet) 10.516 MGD
- 32. Percentage of Maximum Unavoidable Leakage to Net Annual Pumpage
(divide line 31 by line 14 and multiply by 100) 2.00 %
- 33. Total Accounted for Flow (add lines 19, 27 and 31) 481.195 MGD
- 34. Percentage of Total Accounted for Flow to Net Annual Pumpage
(divide line 33 by line 14 and multiply by 100) 91.35 %
- 35. Total Unaccounted for Flow (subtract amount on line 33 from line 14) 45.581 MGD
- 36. Percentage of Total Unaccounted for Flow to Net Annual Pumpage
(divide line 35 by line 14 and multiply by 100) 8.65 %

Please Check Your Calculations

The sum of lines 33 and 35 should equal line 14. If they do not equal, recheck your calculations.
The sum of lines 34 and 36 should equal approximately 100%. If not, check your calculations.

Section III - Maximum Unavoidable Leakage Worksheet

Complete the following calculations to determine your maximum unavoidable leakage. Enter the appropriate amounts in the spaces provided.

A. Cast Iron Pipes With Lead Joints

Age of Pipe	Miles of Pipe	Leakage Rate*...Unavoidable Leakage**
1. 60 yrs. or greater	<u>2703.540</u>	x 3000 g/d/mi = <u>8,110,620</u> g/d
2. 40-60 yrs.	<u>426.410</u>	x 2500 g/d/mi = <u>1,066,025</u> g/d
3. 20-40 yrs.	_____	x 2000 g/d/mi = _____ g/d
4. 20 yrs. or less	_____	x 1500 g/d/mi = _____ g/d

B. All Other Types of Pipes and Joints

5. 60 yrs. or greater	_____	x 2500 g/d/mi = _____ g/d
6. 40-60 yrs.	<u>126.860</u>	x 2000 g/d/mi = <u>253,720</u> g/d
7. 20-40 yrs.	<u>212.340</u>	x 1500 g/d/mi = <u>318,510</u> g/d
8. 20 yrs. or less	<u>767.540</u>	x 1000 g/d/mi = <u>767,540</u> g/d
9. Total Miles	<u>4,236.690</u>	Total Leakage <u>10,516,415</u> g/d

- 10. Total Maximum Unavoidable Leakage, in MGD (divide total leakage on line 9 by
1,000,000) 10.516 MGD
(Enter this amount on line 31 of "Section II - Water Use Audit")

* Leakage Rate expressed in gallons per day per mile (g/d/mi)

** Maximum Unavoidable Leakage expressed in gallons per day (g/d)

**REPORT BY THE CITY OF CHICAGO
DEPARTMENT OF WATER MANAGEMENT
TO
THE ILLINOIS DEPARTMENT OF NATURAL RESOURCES
FOR THE 2008 WATER ACCOUNTING YEAR**

During Water Year 2008, the City of Chicago has continued to promote water conservation. The Department has been engaged in developing a new Water Conservation Strategic Plan which will be released to the public in 2009. This new plan builds on and updates the 2003 Water Agenda which was set forth by Mayor Daley and defines a number of initiatives and policies to better conserve our fresh water and to wisely manage storm water. Our water conservation plan is a partnership among public and private sectors, and each resident of Chicago. It includes investing in infrastructure upgrades, working with our sister agencies and large industrial customers to promote conservation, and developing a plan to meter all residential water users. With the exception of 2005 drought year, the Department continues to see declining water usage due to its continued efforts to reduce water waste by investing in the following programs:

- a.) Water Main Replacement
- b.) Hydrant Custodian Installation
- c.) Education and Public Awareness
- d.) Meter Repair and Replacement
- e.) Elimination of Unused Services
- f.) Underground Leak Detection and Repair
- g.) SCADA System Upgrade
- h.) Installation of Variable Speed Pumps

WATER MAIN REPLACEMENT

The Water Main Replacement Program was designed to address the City's aging water mains. The selection of water mains to be replaced is based primarily from analyzing break history records to determine where replacement would most benefit the water system. The City has placed a high priority on this key component of the Water Conservation Program, and believes it has had a large impact on the reduction of unaccounted for water, and a significant impact on the decline in water pumpage. The program targets a replacement rate of approximately 1% of the system's 4,230 miles of pipe each year. The following table shows the past and current miles of main replaced per year. There have been some setbacks in achieving this goal in several of the last few years, however the Department is working diligently to bring our goal back on track.

Year	96	97	98	99	00	01	02	03	04	05	06	07	08
Miles of Pipe Laid	43.4	46.6	44.5	49.4	42.2	49.5	42.3	38.7	35.9	23.0	33.7	20.7	37.5

HYDRANT CUSTODIANS

The City has historically experienced difficulty in deterring people from opening hydrants during hot summer days. The opening of hydrants creates hazardous traffic situations, may damage adjacent property, and wastes water. In addition, open hydrants reduce the pressure and amount of water available for fire fighting.

In order to minimize this problem, the City began installing hydrant custodians in areas where previous experience indicated that open hydrants may be a problem. This program had to be coordinated with the Fire Department to insure that the hydrants would always be available for fighting fires. The installation of hydrant custodians is a repetitive and evolutionary process. The City develops a locking mechanism and the water thieves develop methods of removal. This has occurred multiple times with the City attempting to stay one lock ahead of the thieves.

The City has experimented with various locking devices throughout the years and has developed two types of technologically advanced custodians that are fairly effective. In addition, the City has developed a stem design that makes it difficult to turn the hydrant valve by reaching through the ports and manually turning the stem. In the 1990's, the City investigated and tried many other deterrents and have found them to be readily defeatable by determined vandals. Over 19,000 of the City's 47,000 hydrants now have custodians. A total of 8,400 of these 19,000 are the newer "NEO" version which operates with a stronger magnet. The City was able to install 280 custodians of the newer version in the year 2008. In areas where repeated open hydrants occur, the City is retrofitting the custodian with an additional spider guard deterrent to prevent damage to the operating mechanism. These retrofits installed since 1998, have demonstrated their effectiveness by a reduction in their frequency of opening. The City has found that the newer "NEO" version of the custodian has had a very significant impact on illegal hydrant openings. The City will still install the additional spider guard retrofits, but only in the areas where the "NEO" has not been successful.

EDUCATION AND PUBLIC AWARENESS

The Department of Water Management engages in public education and awareness on a continuing basis. Conservation messages are conveyed through a variety of channels, including community meetings, literature distribution, give-away items (e.g. buttons; coloring books) and extensive use of the World Wide Web.

Over the past years, we have included themes from the Chicago Water Agenda, 2003. This is a gathering of local initiatives, policies, programs and proposals that address issues of conservation, water quality and storm water management in a coordinated way. The Agenda applies not just to the City of Chicago, but to suburban communities and other cities across the Great Lakes region.

Coordinating with other City departments, the Department of Water Management has been including Agenda messages in the annual Consumer Confidence Report, in development of an educational program for schools, in grass roots presentations to community groups and Chambers of Commerce, and in other appropriate settings. Topics range from techniques of conservation to fire hydrant usages to the prospect of universal customer metering.

METER REPAIR AND REPLACEMENT

This year the City continues to move toward universal metering. A contract to install a automatic meter reading (AMR) system on the over 170,000 metered accounts was started in 2007. This contract is designed to be completed in three years. AMR will enhance customer satisfaction, and reduce operating costs for meter reading. This cost saving measure paves the way for installing meters on the remaining non-metered services and is the most cost effective approach to universal metering.

The City has also made great strides with its volunteer metering program. Accounts which are currently unmetered can have a meter installed free of charge.

The City continued to service those meters presently installed on suburban, commercial, industrial, and municipal accounts. The total installed meter base in Chicago is in excess of 170,000 units. As new housing is erected and rehabilitation continues, the number of meters is increasing. Maintenance of this large installed meter base requires a considerable commitment of manpower and equipment. The City is committed to maintaining its meters in conformance with the recommendation of the meter manufacturers and the AWWA. The City continued its program of upgrading suburban meters to new straight flow through turbo type meters. All of the active suburban accounts now employ turbo style meters. The City's Metering Section also will continue to service, and replace where necessary, those meters presently installed on suburban, commercial, industrial, and municipal accounts.

ELIMINATION OF UNUSED SERVICES

The City continued its efforts to cut and seal unused services. The following table shows the data for termination of unused services over the past ten years.

Year	98	99	00	01	02	03	04	05	06	07	08
Number of Services Terminated	1416	1596	1108	1206	1140	650	820	620	422	297	488

A major effort has been made to eliminate these potential sources of leakage. These water services were terminated by both City forces and by private contractors. Although the termination of unused water services is very expensive, the continued reduction in the number of unused services should help reduce the amount of unaccounted for water.

LEAK DETECTION AND REPAIR

The Department's underground leakage unit, utilizing electronic leak correlators as well as traditional Aquaphones and Geophones, has maintained a high level of effort in its leak detection over the past years. The Department employs three TriCorr™ 2001 correlators which is considered the product of choice by most professional leak detection firms and consultants, particularly in North America. These models are more sensitive in detecting leaks and have better noise filtering capabilities. The Department has continued to have some setbacks in staffing and are working toward goals to provide training for newer staff to complement the leak detection program. Our goal is to employ a total of three electronic leak correlating crews and move toward a goal of surveying 1500 miles per year. The following table demonstrates the Department's efforts toward leak detection.

Year	98	99	00	01	02	03	04	05	06	07	08
Miles of Pipe Surveyed	1463	2222	2174	2364	2390	2310	2200	700	735	1220	1700
Number of Underground Leaks Located	957	1055	1934	994	809	1050	939	400	320	356	590

In addition to the above leak detection efforts, the Department also contracted out services for leak detection. The services included the monitoring for leak noises while performing an ongoing valve inspection program. Where noise was detected, they returned with electronic correlators equipment to pinpoint the leaks for repair. Through our leak detection consultant, we are continuing to use the new acoustic logging system (Permalog), developed by Palmer Environmental, which monitor leak noise at night and transmit leak information to a receiver by simply driving by. This new technology has been employed over the past few years and was found to have some problems at first. Since then, modifications were made to these devices and have proven successful to locate leaks which may have been undetected under the past conventional methods of leak detection. The Department, through our consultant, also has used another breaking technology in leak detection which is the Radcom SoundSens Leak Noise Correlator. This leak location system combines sound logging and correlation by installing three or more correlating pods within an area. The units pick up sound during the night and are then analyzed the next day by downloading the sounds to a central correlator. A multipoint correlation can then be performed between the units resulting in higher degrees of accuracy and allowing nighttime sounding without the need to work during the nighttime.

The Department is also employing the latest technology in the leak detection field for feeder mains also. During 2005 and 2006, we surveyed sections of 36-inch and 60-inch mains with the Sahara® leak detection technology. A tether-controlled Sahara® sensor is deployed inside a pipeline without any disruption to pipeline service. It moves through the pipeline with the flow and pinpoints even the smallest leaks in water mains. More documentation on this technology can be found at <http://www.ppic.com/home/deteccion.html>. In 2007 we started using another newer technology for large diameter pipeline leak detection. This technology is Echologics and it differs from traditional leak correlators in that it uses the water column inside the pipeline to transmit the sound wave generated from a leak. This technology allows greater distances between transmitters and has proven to be worthwhile.

The Department continues investing its time and resources in pipe rehabilitation technology. In 2001 we solicited a number of vendors which presented various techniques used in the industry. The department is still evaluating these techniques to determine suitability for feeder main rehabilitation. The Department completed a cleaning and cement lining project on approximately 8,000 feet of 36-inch cast iron pipe in the spring of 2002 as well as another

cleaning and cement lining project on approximately 4,500 feet of 30-inch cast iron pipe in the spring of 2003. We are currently planning on lining approximately 3,000 feet of 36-inch cast iron main in the spring of 2005.

SCADA SYSTEM

The SCADA system was upgraded during 1996-97 when the five steam stations underwent re-instrumentation. At that time, new well gauges, discharge pressure gauges, and flow meters were replaced. In addition, remote pressure sensors were installed at 36 continuously monitored points in the distribution system. Installation of a total of 48 intermittent pressure monitoring points were also installed. Over the past few years, eight additional continuously monitored points have been added. These points are located mainly in the outlying areas to monitor supply pressure and suburban flow demand patterns. These pressure sensors have proven to aid in pumping station operation by avoiding over pressuring the system and is believed to contribute to significant savings in water use. The upgrade also allowed the SCADA system to monitor in real time the entire pumping station operation. It has also allowed a more complete monitoring and control of pressures and flows in the distribution system on a real time basis. In 2006, the Department started a two year contract to upgrade both the equipment and software to improve the operations and allow even better pressure management. This project will be wrapping up in 2009 and has already proven to be a useful tool to improve operations.

VARIABLE SPEED ELECTRIC DRIVES

The Southwest pumping station which supplies nearly 70 percent of its demand to suburban wholesale customers was the first electric pumping station to undergo installation of variable speed drives. Prior to installation there were wide swings in demand and pressures due mainly to the suburban customer loading. These units have proven to be more efficient concerning water use by adding the flexibility of meeting varying demands without the need to start up additional pumps, and thus over pressurizing the water system. The department is currently evaluating other stations which may benefit from a conversion.

In 2002, the department completed the work at the Roseland pumping station. This station was converted from steam driven turbines to variable speed electric drives. An additional pump was also installed as part of this capital project. The conversion of this station has provided reliability, flexibility and efficiency over steam. The Department is moving toward completing final design plans for the conversion of the Springfield Pumping Station from steam to variable speed electric drives. The Department has completed design and will start construction in 2009 to install variable speed drives for Thomas Jefferson pumping station which will greatly improve pumping operations on the City's northeast side.