



**DEPARTMENT OF WATER MANAGEMENT  
CITY OF CHICAGO**

February 18, 2016

Illinois Department of Natural Resources  
Office of Water Resources  
160 N. LaSalle Street, Suite S-703  
Chicago, Illinois 60601-3117

Enclosed are the completed annual water usage Report LMO-2 and the AWWA Water Loss Audit's Reporting Worksheet and Performance Indicators Sheet for the 2015 water accounting year from October 1, 2014 through September 30, 2015.

A supplemental sheet, attached to the report, details the average daily supply of water transferred to other entities.

A report detailing the activities of the Chicago Water System in regard to water conservation and accountability during the 2015 water accounting year is also attached.

Very truly yours,



Thomas H. Powers, P.E.  
Commissioner



# Illinois Department of Natural Resources

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Bruce Rauner, Governor

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## 2015 Annual Water Use Audit Form (LMO-2)

This form must be completed by all Category IA and IB Permittees for the annual water use accounting year running from October 1, 2014 through September 30, 2015. This form must be submitted to the Department by March 1, 2016.

### Section I - General Information


#### Name, address and phone number of Permittee:

Name: The City of Chicago Department of Water Management  
Address: 1000 East Ohio Street  
Chicago, Illinois 60611  
County: Cook  
Phone: 312-744-7001  
Email:

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

Name: Thomas H. Powers, P.E.  
Address: 1000 East Ohio Street  
Chicago, Illinois 60611  
Phone: 312-744-7001  
Email:

#### Authorized Official

  
Title: Commissioner  
Date: 2/26/16

Service Population: 5,365,598

Service population is the total population the permittee serves with water both inside and outside their corporate limits.

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, CMS.

**Section II - Water Supplied:**

In order to complete this form you will have to first complete the AWWA Free Water Loss Audit Software. Lines 4, 8, 24 and 26 - 38 (highlighted) must be taken directly from the AWWA Water Loss Audit Reporting Worksheet and Performance Indicator sheet. Both the AWWA Water Loss Audit's Reporting Worksheet and Performance Indicator sheet must be submitted along with this form. All amounts must be in units of million gallons per day (mgd) rounded to three decimal places. The AWWA Water Loss Audit Software

**Volume from own sources:**

1. Shallow Well	.....	mgd
2. Deep Well	.....	mgd
3. Lake Michigan (Direct Diverters only)	725.065	mgd
4. Total Volume From Own Sources	725.065	mgd

**Water imported from other sources:**

	<u>Supplier:</u>	<u>Amount:</u>	
5	.....		mgd
6	.....		mgd
7	.....		mgd
8. Total Water Imported		0.000	mgd

**Water exported to other systems:**

	<u>System:</u>	<u>Amount:</u>	
9	Chicago Area Suburban Communities ( See Attachment )	270.025	mgd
10	.....		mgd
11	.....		mgd
12	.....		mgd
13	.....		mgd
14	.....		mgd
15	.....		mgd
16	.....		mgd
17	.....		mgd
18	.....		mgd
19	.....		mgd
20	.....		mgd
21	.....		mgd
22	.....		mgd
23	.....		mgd

24. Total Water Exported	270.025	mgd
25. WATER SUPPLIED (Line 4 + Line 8 - Line 24)	455.040	mgd
26. WATER SUPPLIED (adjusted for master meter error)	437.774	mgd

**Section III; Authorized Consumption:**

27. Billed Metered	170.801	mgd
28. Billed Unmetered	189.394	mgd
29. Unbilled Metered	13.693	mgd
30. Unbilled Unmetered	( See the explanation attachment 1 )	7.641 mgd
(If not using the AWWA default of 1.25% of Water Supplied, provide an explanation)		
31. AUTHORIZED CONSUMPTION	381.529	mgd

**Section IV: Water Losses:**

32. Apparent Losses	2.448 mgd
33. Real Losses	53.796 mgd
34. Water Losses	56.244 mgd

**Section V: Non Revenue Water:**

35. NON REVENUE WATER	77.579 mgd
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**Section VI: Performance Indicators:**

36. Annual cost of Apparent Losses	3,405,067 \$/year
37. Annual cost of Real Losses	3,133,030 \$/year
38. Non-revenue water as percent by volume of Water Supplied	17.7 %

**Section VII - Conversion Table**

Below are conversion calculations to convert the most commonly used units to units of million gallons per day (mgd).

To convert cubic feet per year (cf) to (mgd) use:  
 $(cf \times 7.48) / 1,000,000 / 365 = \text{mgd}$

To convert gallons per year (g) to (mgd) use:  
 $g / 1,000,000 / 365$

To convert gallons per day (g/d) to (mgd) use:  
 $(g/d) / 1,000,000$

To convert million gallons per year (mg) to (mgd) use:  
 $mg / 365 = \text{mgd}$

CITY OF CHICAGO  
DEPARTMENT OF WATER  
SUPPLEMENT TO FORM LMO-2

WATER METERED AND BILLED DIRECTLY BY CHICAGO WATER DEPARTMENT  
OCTOBER 1, 2014 TO SEPTEMBER 30, 2015

ENTITY	MGD
ALSIP *	5.338
BEDFORD PARK *	21.313
BERWYN	5.073
BLUE ISLAND	1.874
BRIDGEVIEW	2.032
BROOKFIELD-N. RIVERSIDE W.C. *	4.346
BURNHAM	0.092
CALUMET CITY	0.398
CALUMET PARK	0.638
CENT. STICKNEY SD	0.108
CICERO	6.832
DES PLAINES *	6.676
DOLTON	2.995
DUPAGE W.C. *	73.173
ELMWOOD PARK	2.111
EVERGREEN PARK	1.828
FOREST PARK	2.491
FOREST VIEW	0.114
FRANKLIN PARK	2.927
GARDEN HOMES S.D.	0.063
HARVEY *	8.845
HARWOOD HEIGHTS	0.793
HILLSIDE-BERKELEY W.C. *	1.707
HOMETOWN	0.324
JUSTICE-WILLOW SPRINGS W.C. *	2.894
LINCOLNWOOD	1.466
MAYWOOD	2.754
McCOOK *	5.234
MELROSE PARK *	7.748
MERRIONETTE PARK	0.188
MIDLOTHIAN-MARKHAM W.C. *	2.741
MORTON GROVE *	2.891
NILES *	5.149
NORRIDGE	1.360
NORTHWEST SUB JOINT ACTION W. A. *	28.087
NORTHLAKE (Partial)	0.033
OAK LAWN *	28.895
OAK PARK	4.931
PARK RIDGE	3.992
RIVER FOREST	1.083
RIVER GROVE	1.060
RIVERDALE	1.472
ROBBINS	1.465
ROSEMONT	1.479
SCHILLER PARK	1.623
SOUTH HOLLAND *	2.055
SOUTH STICKNEY S.D.	2.107
STICKNEY	1.558
SUMMIT	1.084
WESTCHESTER-BROADVIEW W.C. *	3.661
WORTH	0.925
TOTAL	270.025

\* INCLUDES OTHER MUNICIPALITIES  
ALL METERS ARE READ BETWEEN THE 20TH AND 30TH DAY OF EACH MONTH

Explanation for the Report (LMO-2) Line No. 30.  
 (not using the AWWA default of 1.25% of Water Supplied.)

Excessive unbilled unmetered water usage was due to the following factors:

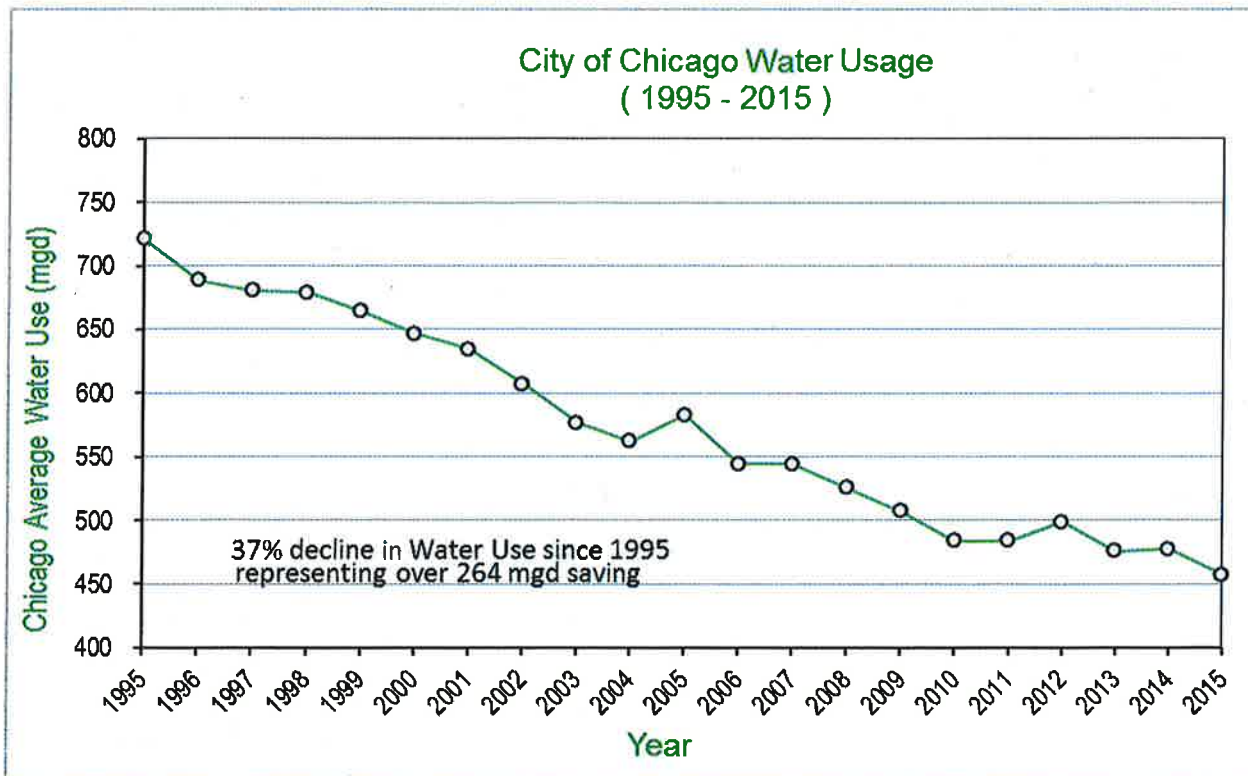
	<u>Estimated Usage</u>	<u>Percentage of water supplied</u>
1. NEW WATER MAIN FLUSHING. An accelerated water main replacement program is in progress. More hydrant flow is needed for water main flushing.	3.702 mgd	0.85%
2. FIREFIGHTING & TRAINING	2.189 mgd	0.50%
3. SEWER CLEANING	0.100 mgd	0.02%
4 STREET CLEANING	0.100 mgd	0.02%
5. PUBLIC FACILITIES CONSTRUCTION	0.438 mgd	0.10%
6. WATER MAIN FLUSHING FOR WATER QUALITY PURPOSES	0.560 mgd	0.13%
7. EXEMPTED UNMETERED ACCOUNTS	0.552 mgd	0.13%
<hr/>		
TOTAL UNBILLED UNMETERED WATER USAGE	7.641 mgd	1.75%

**REPORT BY THE CITY OF CHICAGO  
DEPARTMENT OF WATER MANAGEMENT  
TO  
THE ILLINOIS DEPARTMENT OF NATURAL RESOURCES  
FOR THE 2015 WATER ACCOUNTING YEAR**

During Water Year 2015, the City of Chicago has continued to promote water conservation through 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 drought years, the Department continues to see declining water usage due to its continued efforts to reduce water waste by investing in the following programs:

- 1.) Water Main Replacement
- 2.) Hydrant Custodian Installation
- 3.) Education and Public Awareness
- 4.) Volunteer Metering Program
- 5.) Meter Repair and Replacement
- 6.) Elimination of Unused Services
- 7.) Underground Leak Detection and Repair
- 8.) SCADA System Upgrade
- 9.) Installation of Variable Speed Pumps

The chart below demonstrates our progress with a plan that has had significant results in reducing water usage for the City of Chicago.



## **WATER MAIN REPLACEMENT**

The Water Main Replacement Program was designed to address the City's aging water mains which were installed over 100 years ago at the height of Chicago's exponential growth rate. 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. Prior to 2012, the program had targeted a replacement rate of approximately 1% of the system's 4,350 miles of pipe each year. We are now on a path to target over 2% per year allowing us to mirror the installation rates over 100 years ago. The following table shows the past and current miles of main replaced per year.

We are pleased to report that through the leadership and support of Mayor Rahm Emanuel, the funding to address the needs of our aging infrastructure has become available through a series of water rate increases starting in 2012 with 25% and continuing the next 3 years with 15% each year. Water mains are critical assets to deliver safe potable water to not just Chicago but to its wholesale customers. These unprecedented water rate increases were based on the fact that over 25% of our water mains are over 100 years old and demonstrate our Mayor's vision and commitment to focus on the long term needs of this aging water system. The rate increases will allow us to continue this successful program to reduce water waste as well as fund critical treatment plant and pumping station upgrades. Our long term goals have been set to replace nearly 900 miles of water mains in the 10 year period, from 2012 through 2021

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Miles of Pipe Laid	42.3	38.7	35.9	23.0	33.7	20.7	34.0	32.0	30.0	30.0	70.0	75.0	85.0	95.0

## **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 20,000 of the City's 48,000 hydrants now have custodians. A total of 8,400 of these 19,000 are the newer "NEO" version which operates with a stronger magnet. 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, and extensive use of the World Wide Web. Over the past years, we have included themes from the Chicago Water Agenda. 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. We have also ramped up efforts in a promotional campaign to get conservation messages out to the public through various transportation ads and street signage advertising. Our metersave program message is quite visible throughout the city.

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.

### **VOLUNTEER METERING PROGRAM**

The City has continued to make great strides with its volunteer metering program. Accounts which are currently unmetered can have a meter installed free of charge. By the end of 2015, the City has installed over 84,500 meters, under this program, since its inception in 2009, and plan to install additional 15,000 meters in 2016. To keep up with the program, we have continued to engage in a contract to allow a private contractor to install meters from the volunteer program and supplement our in-house work force. As this program is continuously promoted and more customers realize the financial and water resource benefits, we anticipate a stronger participation, in the years to come, from our unmetered customer base. The Department of Water Management is fully committed to making this a successful program. Also, additional highlights of this program are presented on our promotional website at [www.metersave.org](http://www.metersave.org).

### **METER REPAIR AND REPLACEMENT**

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 266,000 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.

### **COMMERCIAL NON-METERED ACCOUNTS**

The Department of Water Management has continued its efforts to install meters on all active non-metered commercial accounts; this effort has continued in 2015. We have accomplished this task by sending letters requesting that meters be installed per Chicago Municipal Ordinance and conducting field visits to assure that all properties requiring meters work toward installing meters. Although most of these accounts required smaller meters, we have found that some of the larger meters have various circumstances which make this task difficult such as the need to get permits, design plans and the feasibility to construct larger meter vaults to accommodate the some of the larger meters. Once this task was completed the Department has shifted its efforts to meter all un-metered three flat residential buildings and un-metered charitable accounts, which include churches, hospitals and schools. There are 413 such accounts in the system; the plan is to meter all of them by 2017.

### **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 since 2002.

Year	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Number of Services Terminated	1140	650	820	620	422	297	488	510	692	342	476	635	1540	1521

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 has maintained a high level of effort in its leak detection program over the past years. The Department employs one TriCorr TM 2001 correlator and in 2009 purchased some of the newer Digicorr correlators from FCS 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. In addition to our in house forces, the Department also contracts out services for leak detection. The services include not only an ongoing systematic coverage for leak detection of our distribution system every 3-4 years, but also the monitoring for leak noises while performing an ongoing valve inspection program. Through our leak detection consultant, we have been able to employ various technologies to detect and pinpoint underground leakage. One of these technologies: the “Radcom SoundSens” leak noise correlator 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. During 2005 and 2006, we started to survey sections of 36-inch and 60-inch mains with the Sahara® leak detection technology, where 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.puretechltd.com/products/sahara/sahara\\_leak\\_gas\\_pocket.shtml](http://www.puretechltd.com/products/sahara/sahara_leak_gas_pocket.shtml) . 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 to between transmitters and has proven to be worthwhile. More documentation on this technology can be found at [http://www.echologics.com/leakfinder\\_overview.html](http://www.echologics.com/leakfinder_overview.html). Since then, we have been using a similar product, the Primayer leak correlator system and have made an effort to systematically survey our older trunk main systems to assure no leaks are occurring on these mains which could cause catastrophic failures and extensive damage. More documentation on this technology can be found at [http://www.primayer.co.uk/wlc\\_leak\\_location\\_eureka\\_digital.htm](http://www.primayer.co.uk/wlc_leak_location_eureka_digital.htm)

The following table demonstrates the Department’s efforts toward leak detection.

Year	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
Miles of Pipe Surveyed	2310	2200	700	734	1220	1700	1460	1220	1600	1900	1760	1162	1179
Number of Underground Leaks Located	1050	938	400	320	356	590	477	402	300	660	637	380	611

## **SCADA SYSTEM**

The SCADA system was upgraded during 1996-97. At that time new well gauges, discharge pressure gauges, and flow meters were installed. In 2006, the SCADA system was upgraded again with new equipment and software to improve the operations and allow even better pressure management. Today there are 84 remote pressure sensors installed in the distribution system. The sensors are continuously monitoring water pressure in real time for the entire service area of the City of Chicago. Also, there are eight additional continuously monitored points located mainly in the outlying areas to monitor supply pressure and suburban flow demand patterns. These pressure sensors have proven to be a great aid with pumping station operation, by avoiding over pressurizing the system that in turn is believed to contribute to significant savings in water usage. The upgraded SCADA system provided a more complete monitoring and control of pressures and flows in the distribution system on a real time basis.

## **VARIABLE SPEED ELECTRIC DRIVES**

The Chicago water system has 12 pumping stations. Eight of the pumping stations have pumps that are driven by electric motors, and four of these electric stations are equipped with electronically controlled variable speed drives. The variable speed drives allow the operating staff to efficiently adjust water pumpage without over pressurizing the water distribution system, which reduces water main breaks and wasting of water. The remaining four stations are steam powered with manually controlled pumps. The plan is to convert these stations to electrical power with variable speed drives. The Department has just completed the conversion of Springfield Pumping Station in 2015. We have also awarded a contract for the engineering design services for the conversion of Central Park Pumping Station, this project will go into construction in 2017. The last steam powered station, Western Ave. Pumping station will follow soon after the start of the Central Park Station construction.

# AWWA Free Water Audit Software: Reporting Worksheet

AWWA V5.0  
American Water Works Association  
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Click to access definition  
Click to add a comment

**Water Audit Report for:** City of Chicago, Department of Water Management  
**Reporting Year:** 2015 10/2014 - 9/2015

Please enter data in the white cells below. Where available, metered values should be used; if metered values are unavailable please estimate a value. Indicate your confidence in the accuracy of the input data by grading each component (n/a or 1-10) using the drop-down list to the left of the input cell. Hover the mouse over the cell to obtain a description of the grades

All volumes to be entered as: **MILLION GALLONS (US) PER YEAR**

To select the correct data grading for each input, determine the highest grade where the utility meets or exceeds all criteria for that grade and all grades below it.

Master Meter and Supply Error Adjustments

### WATER SUPPLIED

----- Enter grading in column 'E' and 'J' -----				Pcmt:	Value:	
Volume from own sources:	9	264,648.725	MG/Yr	8	1.78%	MG/Yr
Water imported:	5	0.000	MG/Yr	0		MG/Yr
Water exported:	9	98,559.125	MG/Yr	5	-1.67%	MG/Yr

Enter negative % or value for under-registration  
Enter positive % or value for over-registration

**WATER SUPPLIED:** 159,787.346 MG/Yr

### AUTHORIZED CONSUMPTION

Billed metered:	5	62,342.365	MG/Yr	0		MG/Yr
Billed unmetered:	5	69,128.810	MG/Yr	0		MG/Yr
Unbilled metered:	5	4,998.055	MG/Yr	0		MG/Yr
Unbilled unmetered:	6	2,788.965	MG/Yr	0		MG/Yr

Unbilled Unmetered volume entered is greater than the recommended default value

**AUTHORIZED CONSUMPTION:** 139,258.195 MG/Yr

Click here: for help using option buttons below

Pcmt: 0 Value: 2,788.965 MG/Yr

Use buttons to select percentage of water supplied OR value

Pcmt: 0.25% Value:  MG/Yr

Pcmt: 0.50% Value:  MG/Yr  
0.25% Value:  MG/Yr

### WATER LOSSES (Water Supplied - Authorized Consumption)

20,529.151 MG/Yr

#### Apparent Losses

Unauthorized consumption: 399.468 MG/Yr

Default option selected for unauthorized consumption - a grading of 5 is applied but not displayed

Customer metering inaccuracies: 338.394 MG/Yr

Systematic data handling errors: 155.856 MG/Yr

Default option selected for Systematic data handling errors - a grading of 5 is applied but not displayed

**Apparent Losses:** 893.718 MG/Yr

#### Real Losses (Current Annual Real Losses or CARL)

Real Losses = Water Losses - Apparent Losses: 19,635.433 MG/Yr

**WATER LOSSES:** 20,529.151 MG/Yr

### NON-REVENUE WATER

**NON-REVENUE WATER:** 28,316.171 MG/Yr

= Water Losses + Unbilled Metered + Unbilled Unmetered

### SYSTEM DATA

Length of mains:	9	4,236.7	miles
Number of active AND inactive service connections:	9	517,132	
Service connection density:	?	122	conn./mile main

Are customer meters typically located at the curbside or property line? No

Average length of customer service line: 50.0 ft (length of service line, beyond the property boundary, that is the responsibility of the utility)

Average operating pressure: 45.0 psi

### COST DATA

Total annual cost of operating water system:	10	\$790,139,000	\$/Year
Customer retail unit cost (applied to Apparent Losses):	10	\$3.81	\$/1000 gallons (US)
Variable production cost (applied to Real Losses):	7	\$159.56	\$/Million gallons <input type="checkbox"/> Use Customer Retail Unit Cost to value real losses

### WATER AUDIT DATA VALIDITY SCORE:

\*\*\* YOUR SCORE IS: 75 out of 100 \*\*\*

A weighted scale for the components of consumption and water loss is included in the calculation of the Water Audit Data Validity Score

### PRIORITY AREAS FOR ATTENTION:

Based on the information provided, audit accuracy can be improved by addressing the following components:

1: Billed metered

2: Billed unmetered

3: Unbilled metered



AWWA Free Water Audit Software:  
System Attributes and Performance Indicators

WIAS v5.0  
American Water Works Association  
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Water Audit Report for: **City of Chicago, Department of Water Management**  
Reporting Year: **2015** **10/2014 - 9/2015**

**\*\*\* YOUR WATER AUDIT DATA VALIDITY SCORE IS: 75 out of 100 \*\*\***

**System Attributes:**

Apparent Losses:	893,718	MG/yr
+ Real Losses:	19,635,433	MG/yr
= <b>Water Losses:</b>	<b>20,529,151</b>	MG/yr
<b>Unavoidable Annual Real Losses (UARL):</b>	<b>2,253,81</b>	MG/yr
Annual cost of Apparent Losses:	\$3,405,067	
Annual cost of Real Losses:	\$3,133,030	Valued at <b>Variable Production Cost</b>

Return to Reporting Worksheet to change this assumption

**Performance Indicators:**

Financial:	Non-revenue water as percent by volume of Water Supplied:	17.7%
	Non-revenue water as percent by cost of operating system:	1.0% Real Losses valued at Variable Production Cost
Operational Efficiency:	Apparent Losses per service connection per day:	4.73 gallons/connection/day
	Real Losses per service connection per day:	104.03 gallons/connection/day
	Real Losses per length of main per day*:	N/A
	Real Losses per service connection per day per psi pressure:	2.31 gallons/connection/day/psi
	From Above, Real Losses = Current Annual Real Losses (CARL):	19,635,433 million gallons/year
	Infrastructure Leakage Index (ILI) [CARL/UARL]:	8.71

\* This performance indicator applies for systems with a low service connection density of less than 32 service connections/mile of pipeline