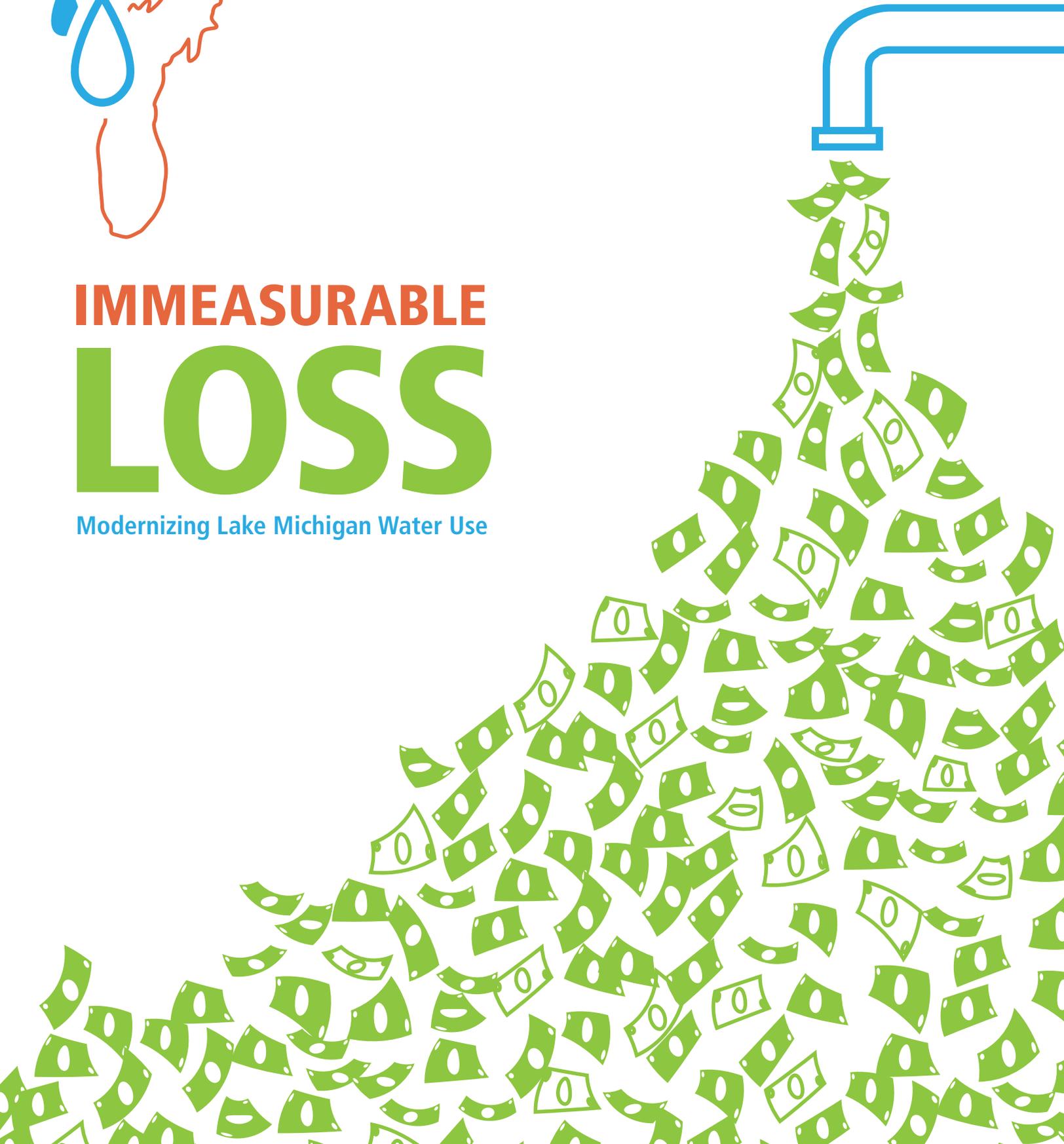
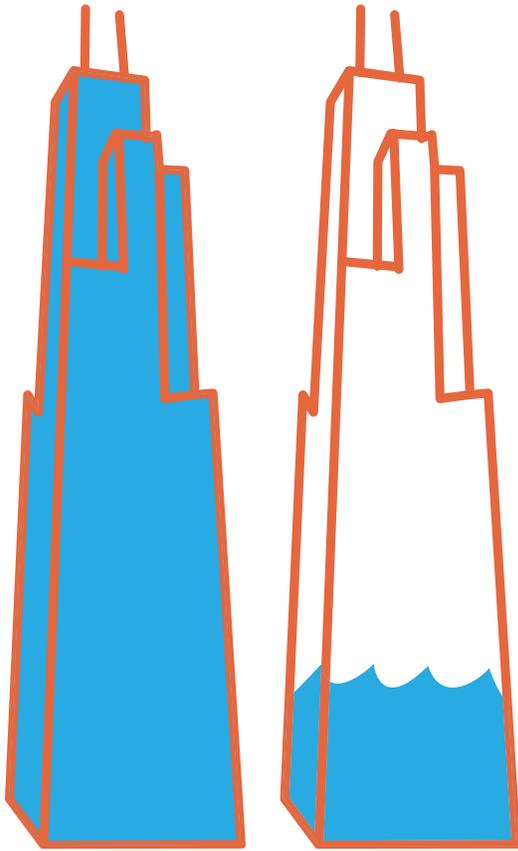




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Modernizing Lake Michigan Water Use





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ACKNOWLEDGMENTS

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EXECUTIVE SUMMARY

The Chicago area is privileged to be situated on the shores of Lake Michigan, the third largest of the Great Lakes, which altogether account for 20 percent of the world's readily available freshwater. Lake Michigan supports a unique ecosystem, provides a breathtaking natural contrast to Chicago's skyline and the many communities lining its shores, and offers a critical asset—freshwater—that our residents and businesses rely upon to grow and prosper.

However, the presence of this vast Lake too often lends the illusion that our water is limitless. In fact, both the water itself and the public funds required to attain, treat and deliver it are finite. Every day tens of millions of gallons of Lake Michigan water are lost due to leaks, faulty meters or accounting errors, never producing any revenue. Water also goes to waste through inefficient plumbing and excessive outdoor use. Both lost water—which costs money to produce—and wasted water—which was paid for but used unproductively—are a financial burden. Fortunately, the factors that lead to loss and waste are controllable, and the problem is solvable.

If this considerable inefficiency was the whole story, we'd still have quite a challenge to overcome—repairing thousands of miles of pipe, replacing tens of thousands of worn-out meters, upgrading plumbing fixtures—but even those massive maintenance and modernization efforts would not address an underlying, fundamental problem: While we know our region is losing vast sums of Lake Michigan water, and we know this inefficiency is costing us money, we don't have a clear picture of how much water or how much money we are wasting. The best available data suggest the problem is large—approximately 70 million gallons a day in water loss alone—but the method of calculating that figure is suspect. The conditions of use Illinois has long attached to Lake Michigan water permits do not capture data that would identify the causes of loss and solutions to prevent it, nor is data collected adequate to guide utilities to adopt best practices for water resources management. The accounting methodology attached to those permits is simply out-of-date; to prompt more efficient and cost-effective water resources management, Illinois should modernize this process. Other permit conditions influence how local water utilities manage rate setting, metering, plumbing and outdoor usage—and these are equally in need of modernization.

Fortunately, in early 2013, the Ill. Dept. of Natural Resources (IDNR)—which manages the permits and usage conditions described above—began circulating a proposed series of modernization measures. Metropolitan Planning Council (MPC) supports the majority of those measures; this paper describes why they are necessary, how the region will benefit and areas where we believe IDNR should revise its proposals. *Immeasurable Loss* explores what we know and what we don't know about our management of Lake Michigan water so local and state elected officials, water resource professionals, utility managers and other stakeholders can review IDNR's proposals with as much information as possible. Ultimately, IDNR's proposals and MPC's recommendations will position northeastern Illinois to make more productive and cost-effective use of its Lake Michigan water by reducing loss and waste—of both water and scarce public dollars.

MPC's proposed solutions, laid out in detail in this report and summarized below, fall under five action areas:

Solution #1

Improve the existing accounting system, while exploring a new approach

In the near-term, IDNR should implement its proposal to eliminate the Maximum Unavoidable Leakage exemption. Over the next three years, IDNR and its permittees should begin to explore the possible benefits of a more thorough auditing process, the American Water Works Association's M36 methodology.

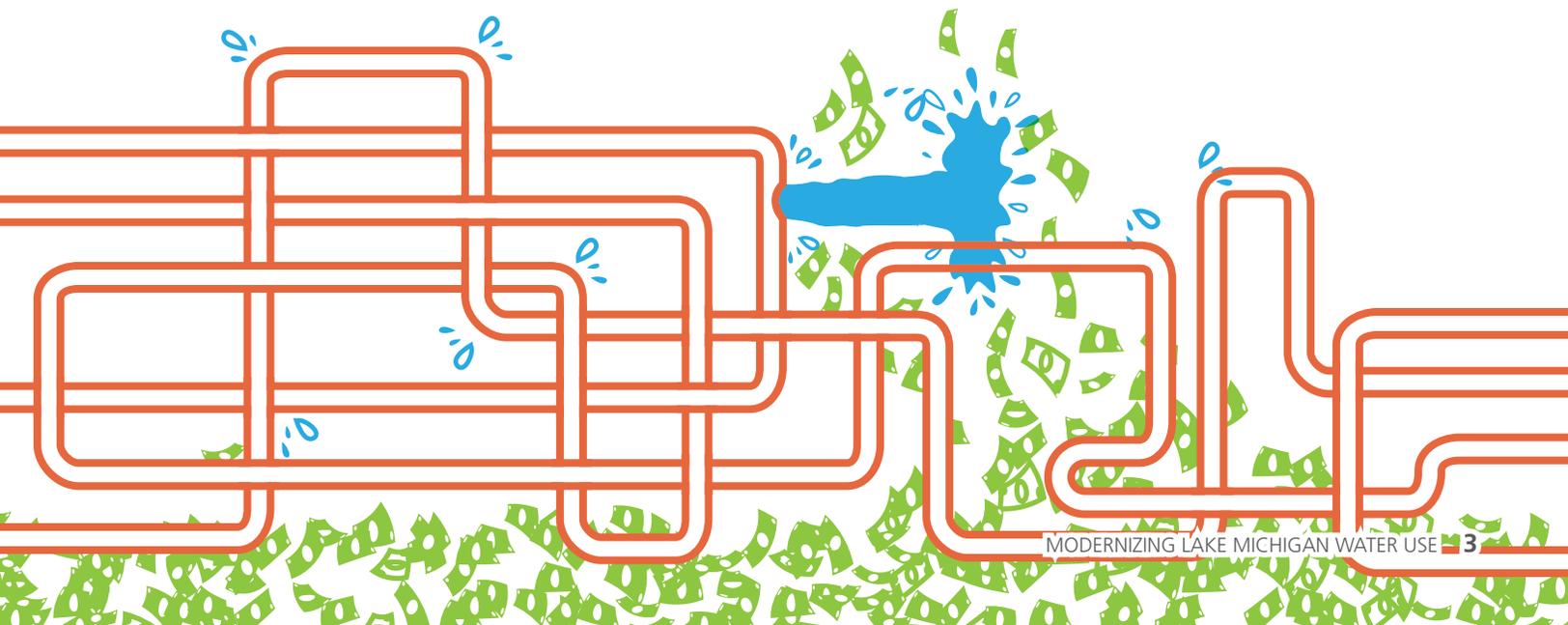
What will it achieve? This change will improve the quality of information IDNR and permittees have to make decisions about how best to manage our Lake Michigan water.

Solution #2

Encourage communities to set water rates based on cost and use comprehensive metering

Water utilities—both public and investor-owned—should adopt full-cost pricing in order to generate sufficient revenues for high-quality water management now and in the future. In the near-term, IDNR should recommend use of full-cost pricing and provide guidance to permittees on cost accounting and rate setting. IDNR should require a shift to full-cost pricing over the next 10 years. In order to ensure accurate accounting, IDNR and permittees should move toward comprehensive, advanced metering. IDNR should also require completion of metering plans for all permittees not currently universally metered.

What will it achieve? Water resource managers will generate sufficient revenue from system users to operate, maintain and invest in high-quality water systems.



Solution #3

Require permittees to adopt modern plumbing standards

IDNR should move ahead with its proposal to require permittees to adopt more modern plumbing codes, requiring the use of water-efficient WaterSense plumbing fixtures for new installations. Further, IDNR should recommend permittees adopt local codes modeled after the forthcoming Illinois Plumbing Code Green Supplement from the Ill. Dept. of Public Health, or more frequently revised model codes from multiple national professional organizations. Finally, IDNR should coordinate with the Ill. Environmental Protection Agency and Ill. Dept. of Public Health to develop a statewide non-potable water reuse policy that protects public health and water quality while putting available water resources to more productive use.

What will it achieve? Collectively, these reforms will put Illinois on the leading edge of plumbing technology, to ensure the most efficient use of water in homes and businesses.

Solution #4

Strengthen and streamline outdoor water use standards

IDNR should implement its proposals to add a sprinkling ordinance to the list of water conservation practices permittees must implement, to modify the sprinkling requirement to add time-of-day and days-per-week restrictions, and to require new/replacement sprinklers to have a WaterSense-labeled irrigation controller. Further, IDNR should look to the Northwest Water Planning Alliance or Chicago Metropolitan Agency for Planning's (CMAP) Model Water Use Conservation Ordinance as regional models for progressive action on discretionary outdoor water use.

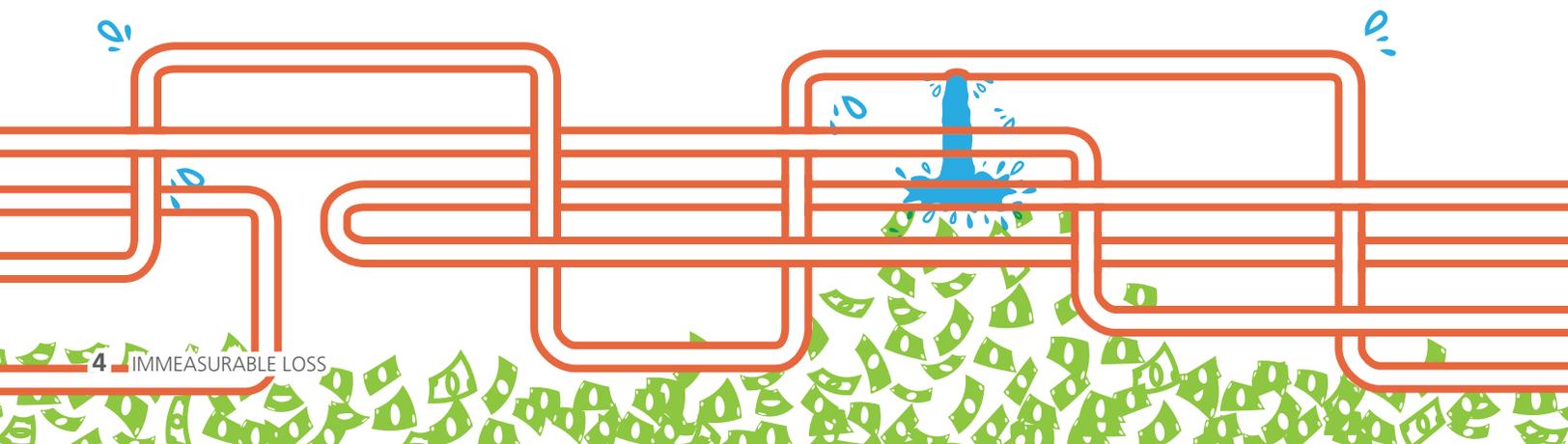
What will it achieve? These changes will help reduce permittees' peak demand for water, which in turn will alleviate the consequences of droughts, reduce the need for communities to make capital expansions to their water systems and possibly even allow communities to reduce their requested allocations of Lake Michigan water, freeing up water for other users—and regional growth.

Solution #5

Increase the capacity of IDNR's Office of Water Resources to provide greater support to permittees

IDNR needs to build the capacity of its Lake Michigan management program in order to analyze incoming data, check for possible inaccuracies, work with permittees on controlling water loss, and use every feasible means to manage Illinois' Lake Michigan diversion as efficiently as possible.

What will it achieve? An emboldened IDNR will be able to provide educational resources, technical assistance, data monitoring and other support to permittees, all in the service of improved management.



WHY MODERNIZE?

During every moment of every day, northeastern Illinois is losing Lake Michigan water, and with it, the money rate payers contributed to pumpage, treatment to drinking standards, and distribution through thousands of miles of pipe.

To give a sense of magnitude, the best available information about annual water use—the reporting form, known as the **LMO-2**, submitted by the 200-plus local permittees using Lake Michigan water—suggests that in 2010, the Chicago region lost approximately 70 million gallons of Lake Michigan water per day, or 26 billion gallons a year. Put another way, approximately one and one-third Willis Towers full of water are lost each week in northeastern Illinois. Financially speaking, if that water had been sold to an available market in 2010, the estimated retail value would have been \$98 million a year. (The actual cost of producing that lost water was less than that, but is ultimately an unknown figure, as the same LMO-2 form does not tally cost.)

Most of the loss numbers derived above stem in part from **Maximum Unavoidable Leakage (MUL)**, an outdated means of estimating water loss from transmission pipes, and then exempting it from reported water loss totals. IDNR is rightfully proposing MUL be eliminated. Without that exemption in place, our understanding of both water loss and necessary investments will improve. MUL leads to a false impression of how well we manage our water; we may be losing more, we may be losing less—but in either event, we simply don't know.

Eliminating MUL is just one of the modest, prudent steps toward modernization IDNR has proposed. It's also consistent with IDNR's obligations: The Illinois Level of Lake Michigan Act (1996) states that IDNR:

"...shall require that all feasible means reasonably available to the State and its municipalities, political subdivisions, agencies and instrumentalities shall be employed to conserve and manage the water resources of the region and the use of water therein in accordance with the best modern scientific knowledge and engineering practice." (615 ILCS 50/5 Section 5, emphasis added).

Additional agreements—a U.S. Supreme Court Decree and the Great Lakes Compact most notably—reinforce the need for modernization.

We know MUL needs to go. We also know that IDNR's current permit conditions on rate setting, metering, outdoor water use and plumbing need some work to match leading standards in water resources management. If grass in northeastern Illinois' climate can thrive with only an hour or so of watering each week, and toilets can be flushed safely with only a few gallons, then IDNR's permit conditions should encourage the appropriate amount of water use. IDNR's proposed changes in these areas move us in the right direction; MPC does, however, recommend some slight course changes, outlined below.

While these compelling environmental, legal and ethical imperatives for reducing water loss and waste exist, the ultimate argument for doing so is purely economic. Freshwater is inherently a natural asset, but after it has been pumped from an original source, treated to potable (drinkable) standards, and finally distributed to end users, it has even greater value. Each step in the process of providing usable water—energy, pipes, labor, etc.—entails costs and adds value; the revenue generated from selling that water should cover those costs. At the same time, when rate payers buy water that is then wasted, it is just "money down the drain."

As in any situation involving asset management, the goal of managing our Lake Michigan water is to gain maximum possible value from it for the longest possible period of time. That means we must be able to make informed, data-driven decisions about infrastructure investment, operations and upgrades to the technology and processes used to deploy our water. Better information would result in a more comprehensive understanding of water resources management in northeastern Illinois, enabling more informed decisions about future Lake Michigan water allocations to current and potential users. Relevant data also would help the Ill. Environmental Protection Agency (IEPA) prioritize loan assistance for infrastructure repair or modernization through the State Revolving Fund or Clean Water Initiative, creating incentive for the rest of the state to tackle water infrastructure and service reinvestment. Better data linked with priority-based state funding could spur more effective capital investment and operational decisions, particularly with regard to water loss. Such improved information would help local water utilities understand how much and what kind of loss is feasibly preventable, allowing them to plan short- and long-term water loss remediation efforts.

The lessons from Lake Michigan, which is the only water source in northeastern Illinois managed through any sort of rigorous permitting structure, will have application to how

the state manages groundwater and other surface waters, as well as in other Great Lakes states evaluating Illinois as a model. IDNR's oversight and management structure is a model worth emulating, but only after its processes, policies and capacities have been updated to meet the demands of modern water resources management.

IDNR's proposals to modernize Illinois' Lake Michigan water use permit conditions reflect the agency's strong desire to improve practices and policies that will allow the state to make informed decisions about future allocations of Lake Michigan water to communities dependent on dwindling groundwater resources; prioritize infrastructure funding assistance for water resource managers; and demonstrate to other Great Lakes states and provinces that Illinois is the best possible steward of our unique diversion.

MPC strongly supports these changes as good first steps toward improving Illinois' Lake Michigan water use and loss reporting system and modernizing the state's water use policies and practices. We urge permittees and other stakeholders to support IDNR's proposed changes as necessary and long-overdue improvements that will provide not only the state, but also permittees with better information and tools to manage their water allocations.

Key terms

Maximum Unavoidable Leakage (MUL) is a calculated allowable leakage exemption based on miles, age, size and type of pipes. It is an inaccurate means of estimating water loss, and IDNR has proposed eliminating it.

Unaccounted For Flow (UFF) is water that is not delivered to end users. It is calculated by taking the total amount of water supplied to a system and subtracting the amount known to be used, as well as subtracting the MUL. Based on existing rules, this number cannot be greater than 8 percent of total pumpage.

Net annual pumpage is the amount of water pumped by a utility in a year, minus the water sold to other communities.

Total loss is the sum of MUL and UFF and is not an actual measurement of total loss in individual systems.

RESEARCH METHODS

MPC staff prepared this study using a variety of methods:

Analyzed LMO-2 data for all Lake Michigan permittees for the period 1999-2010. This information was not readily available online, and we are extremely grateful to IDNR for making it available to us. Any and all information about water use, water loss or pipe miles comes from those records. We also analyzed IDNR's water rate surveys to identify the market value of the region's lost water.

Analyzed lawn sprinkling and plumbing ordinances for all Lake Michigan-served municipalities, as well as many of northeastern Illinois' groundwater and Fox River communities, to gauge current trends in those areas. In general, municipal ordinances are posted online; in the event that we could not find information online, we made every effort to contact the municipality and determine the status of the relevant ordinance.

Reviewed how other states and water resource professionals are modernizing their practices, including an analysis of the nature and extent to which the American Water Works Association's M36 methodology for assessing water use and loss is being used elsewhere. Additionally, we reviewed information from other organizations working on the same issues and strived to develop recommendations consistent with *Water 2050*, northeastern Illinois' regional water supply plan.

Spoke with several municipalities, investor-owned utilities and other water resource management professionals to get honest feedback on permit compliance (see sidebar). These conversations were either in-person or over the phone, and were often followed by a series of email questions. We inquired about water usage and loss accounting, experience with the LMO-2 form and any known alternatives to that form. When relevant, we also discussed interactions with IDNR staff, what kind of support permittees have received from IDNR and what kind of support they would like to receive. These conversations provided a sounding board and reality check as we analyzed LMO-2 data and began preparing recommendations.

Professionals consulted for this paper

Bold type indicates Lake Michigan permittee.

Alliance for Water Efficiency

American Water Works Association

Center for Neighborhood Technology

Chicago Metropolitan Agency for Planning

City of Blue Island

City of Chicago

City of Des Plaines

Village of Glenview

Village of Grayslake

Illinois American Water (holds multiple permits for several service areas)

Illinois Dept. of Natural Resources

Illinois-Indiana Sea Grant

Village of LaGrange

Village of Lake Zurich (has permit, but has not commenced use)

Northwest Water Planning Alliance

Village of Palos Park

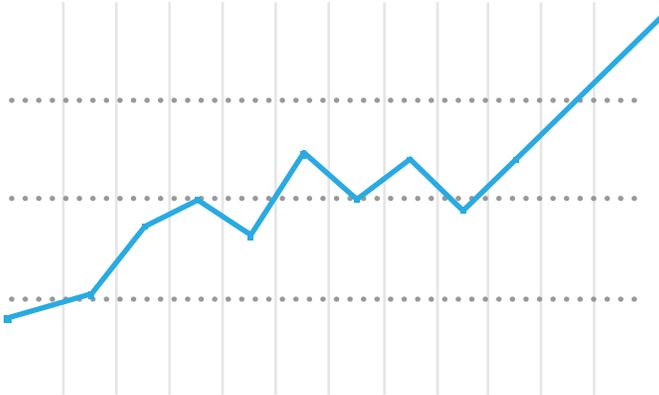
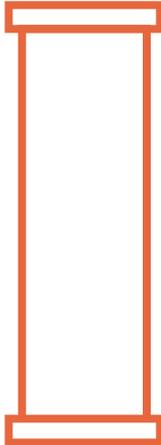
Village of Westmont

Village of Wheeling



SOLUTION #1

Improve the existing accounting system, while exploring a new approach



What’s the problem? The current water loss reporting process IDNR uses does not provide useful data for making water resources management decisions at the state, regional or local level.

What’s the solution? In the near term, IDNR should implement its proposal to eliminate the Maximum Unavoidable Leakage exemption from its permittees’ accounting process. Over the next three years, IDNR and its permittees should begin to explore the possible benefits of a more robust accounting process, starting with the American Water Works Association’s M36 water audit method.

What will it achieve? This change will improve the quality of information IDNR and permittees have to make decisions about how best to manage our Lake Michigan water.

The continued existence of Maximum Unavoidable Leakage (MUL) is a problem. Calling any water loss “unavoidable” can lead to acceptance, which can become a rationale for inaction. What’s more, the methodology of calculating MUL is out-of-date, and the fact that MUL is exempted from regulatory compliance results in a lot of hidden loss. IDNR is rightfully proposing that MUL be eliminated; MPC supports that wholeheartedly.

Given the economic imperative driving much of the need for modernizing Lake Michigan permit conditions, IDNR also should replace the term **Unaccounted for Flow (UFF)**—water that is not delivered to end-users—with “non-revenue water,” the preferred industry terminology. Language matters, and both MUL and UFF disassociate water from its value, which runs counter to modern asset management principles, wherein water either generates revenue (to reinvest in improvements and/or operations), or it doesn’t. Dollars mean more to most rate payers, voters and elected officials than volumetric measures of water. So while several million gallons of lost water may not make an impression on most people, the loss of several hundred thousand dollars—as suggested

by “non-revenue water”—is more likely to spur demand to stop the waste.

Finally, even after MUL is eliminated, the remaining information requested on the annual LMO-2 form will not sufficiently describe how well any given permittee is managing Lake Michigan water. This is an additional area where IDNR needs to be bolder. Critical factors such as system size and age, customer distribution and a water utility’s financial condition also influence a utility’s decision making, operations and investment patterns. Rather than set one standard (e.g., 8 percent UFF happens to be the standard selected by IDNR), we should develop a more comprehensive means of measuring how well Lake Michigan users manage their individual allocations. In the short term, this means adding questions to the LMO-2; in the long term, it means exploring other tools to gather information on utility performance. Fortunately for Illinois, the American Water Works Association’s M36 water auditing tool is a readily available alternative, though some work needs to be done to ensure it provides more accurate and informative information than the LMO-2.

ELIMINATING MAXIMUM UNAVOIDABLE LEAKAGE

Fundamentally, MUL results in an incomplete picture of water loss in the region. The older the pipe being documented, the more water IDNR accepts it will “unavoidably” lose. The pipes’ material also is considered; cast iron pipes with lead joints are forgiven for more leakage than other pipe materials. However, this both provides a passive disincentive for infrastructure modernization and presents a misleading picture of water loss.

MUL was designed this way so as not to penalize older communities with older water systems. Lost water has always been a financial drain, but when MUL was established many of the components needed to make upgrades (energy, processing chemicals, etc.) were less expensive than they are today. In the roughly 40 years since, these costs have risen substantially, and with them the cost and value of each and every gallon of Lake Michigan water that is treated and pumped for consumption, but then disappears on its way to a revenue-generating use. Because MUL is both regarded as unavoidable and exempted from regulatory scrutiny, it masks the true amount and cost of water loss.

This is a big problem, but we don’t actually know how big. According to the compiled LMO-2 forms for the entirety of the Lake Michigan service area in Illinois, in 2010 northeastern Illinois tallied 35.7 million gallons a day (mgd) in MUL, or more than 13 billion gallons a year.

Assuming for moment that this information reflects reality, for the region as a whole, this represents approximately 3.5 percent of net annual pumpage. Chicago’s reported MUL is relatively low, and because its total water consumption is much larger than other Lake Michigan water permittees, it has a substantial and distorting effect on regional figures.

Omitting Chicago reveals that MUL for the rest of the Lake Michigan permittees is approximately 5 percent of net annual pumpage. However, in some communities, MUL is a much larger percentage. In 1999, 12 permittees reported MUL at more than 10 percent of net annual pumpage. By 2010 this had increased to 27 permittees. Again, all this loss is exempted from the 8 percent UFF regulatory standard. Eliminating the MUL exemption would prompt a range of water infrastructure improvements, from pipe repair to meter upgrades, to reduce that component of loss. Permittees would still strive to hold water loss under 8 percent of net annual pumpage, not 8 percent plus some highly variable additional amount.

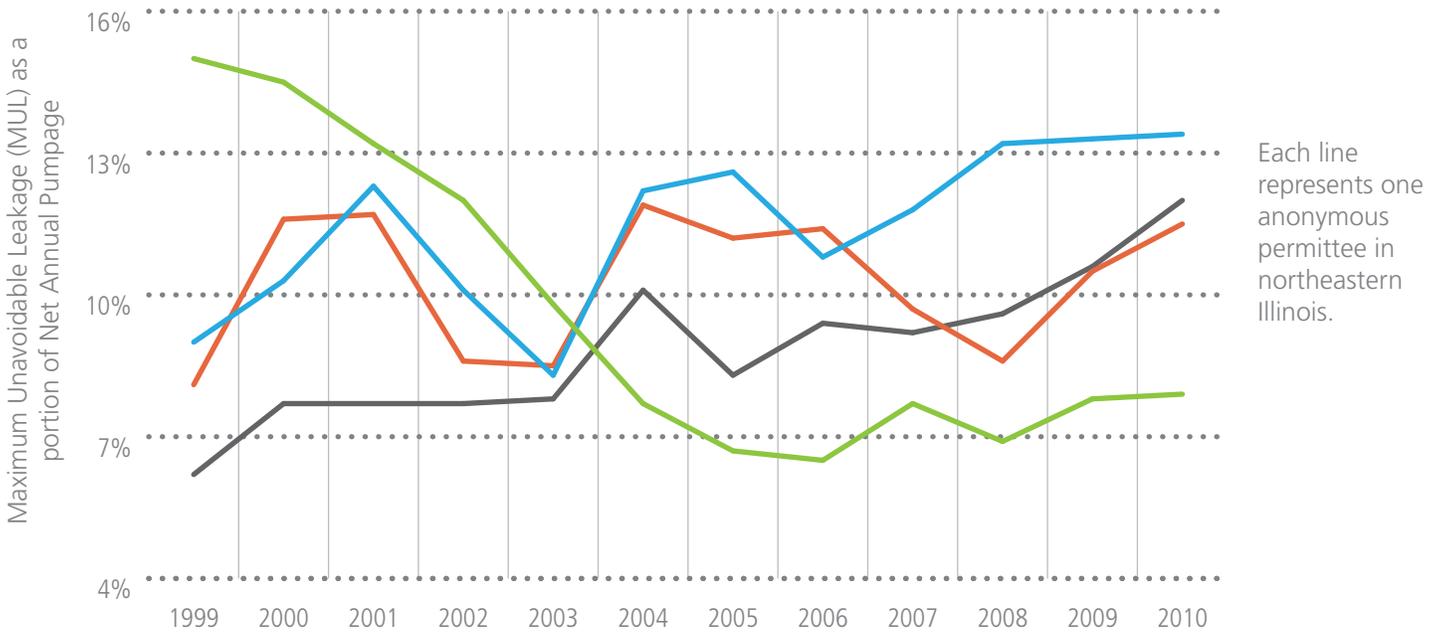
MUL leads to an incomplete understanding of the region’s water loss in a variety of ways:

#1 MUL is a very coarse estimate. To illustrate, the City of Chicago has about 1,000 miles of pipe more than 100 years old. A pipe that is 100 years old almost certainly performs differently than a pipe that is 60 years old, and yet the MUL calculation lumps together all the pipes across this wide age spread into a single classification. Likewise, a pipe that is 61 years old may perform comparably to a pipe that is 59 years old, and yet the MUL calculation artificially divides such pipe, attributing an additional 500 gallons of water loss per mile per day to the slightly older pipe. What’s more, age is not the sole determinant of pipe quality: Many public works departments acknowledge that pipes installed in the 1960s and 1970s were made of inferior materials, and probably leak more water than the MUL formula credits to them. Additionally, many utilities now use technology to repair pipes in place, rather than replace them; but this innovation, like many others, unfortunately cannot be reflected on the LMO-2. Age-based categories are convenient, but when they are so crude, they do not help IDNR garner useful information. Is there 35.7 million gallons a day leaking out of our pipes solely due to age? We don’t know.

#2 In many instances, MUL is highly variable from year to year, which should not be the case. (See fig. 1, facing page.) Primarily a function of pipe age, MUL, not surprisingly, is on the rise in the region as a whole; pipes almost invariably age faster than they are replaced. We also should expect that within any given community, MUL will change very little from one year to the next. A large portion of a pipe system would need to be replaced or removed entirely in order for MUL to decrease dramatically from year to year. In general, data from permittees’ LMO-2 forms confirm this premise. Most communities have slightly but steadily increasing MUL (some have slightly but steadily decreasing MUL, which is certainly preferable—perhaps the result of new pipe being installed.) Sharp year-to-year decreases might suggest major replacement projects, whereas sharp increases might indicate a large portion of pipe moved from one MUL age bracket (e.g. 20 to 40 years old) to the next (40 to 60 years old).

Fig 1. Northeastern Illinois permittees reporting inconsistent data

Permittees with extreme year-to-year fluctuations in reported MUL



Permittees with unusual year-to-year variations in reported pipe miles

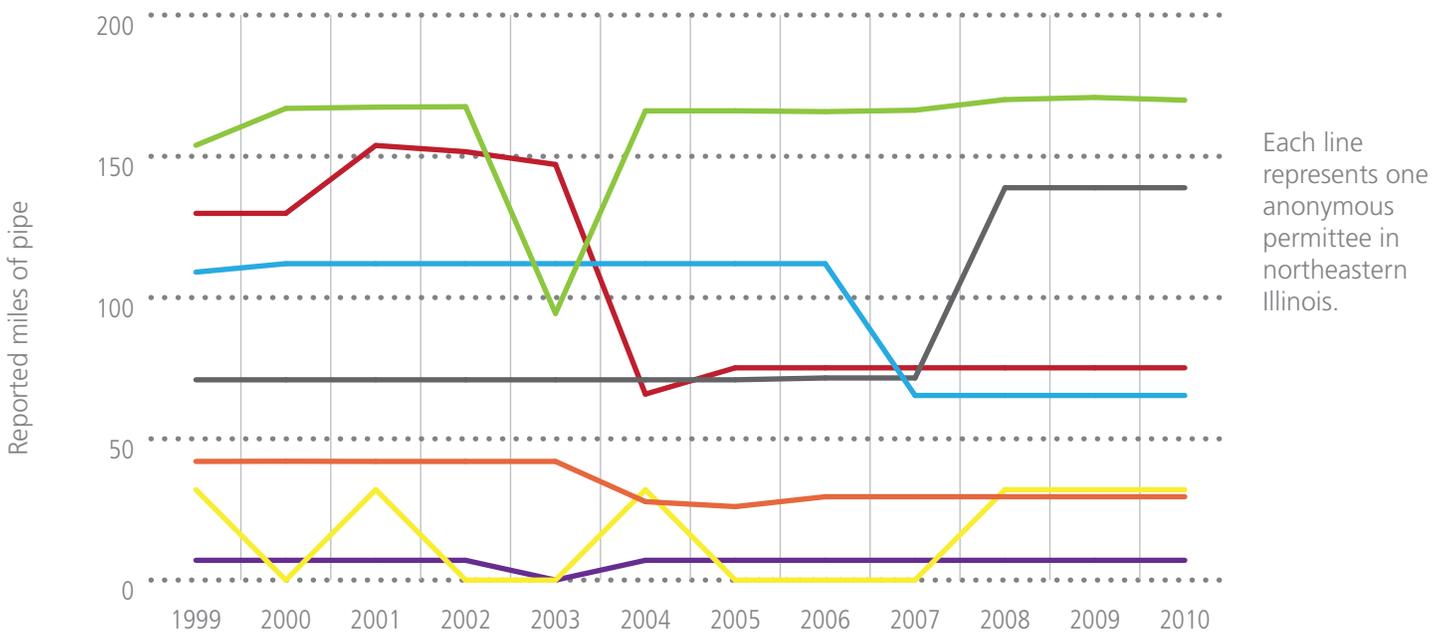
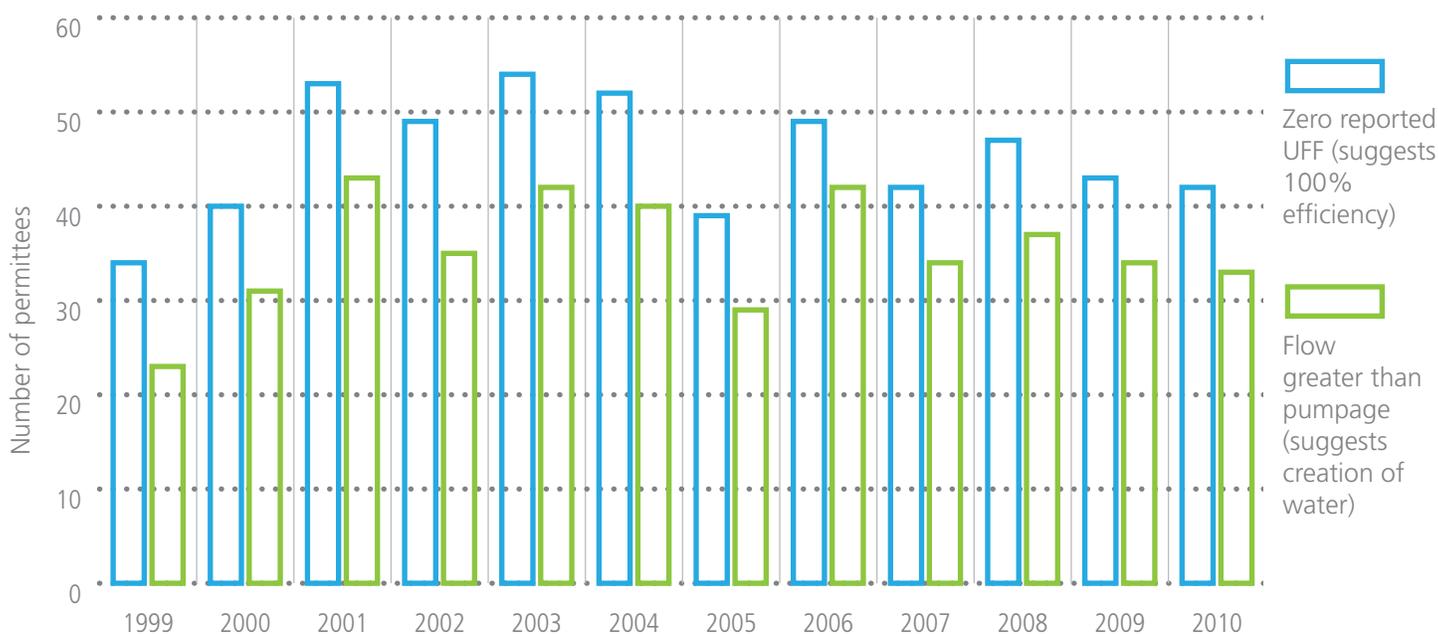


Fig 2. Current formula leads to impossible scenarios of zero water loss, created water



However, several permittees reported substantial fluctuations in MUL, and these generally corresponded to repeated increases and decreases in pipe miles—even though water pipes don’t just appear and disappear. (Again, see fig. 1, previous page.) For instance, one permittee reported well over 300 miles of total pipe for several years, then suddenly dropped to 30 miles. Another permittee reported 32 miles of pipe in some years, and 0 in others. A third permittee reported a steady number of pipe miles, which then doubled in one year, before returning to the previous total the next year. The consequence is that in the “double” year, all water loss was attributed to MUL, and none to UFF, obscuring the permittee’s actual water loss. This was almost certainly just a data input error—the reported pipe miles are exactly twice the amount as in previous years—but there is no evidence that this conspicuous discrepancy was addressed by IDNR or the utility itself.

Regulatory standards based on something as tangible as pipe miles and materials also should require evidence of a geo-spatial asset management approach—i.e., a demonstrated knowledge or articulation of system and maintenance re-

ords—but the LMO-2 requires only an annual mileage total. No narrative explanation is required when submitting the LMO-2, so these fluctuations do not have ready explanations.



#3 In newer water systems, the MUL exemption clearly overestimates water loss from pipes.

Between 1999 and 2010, an average of 35 permittees reported no UFF in any given year, because all reported water loss was exempted as MUL. (See fig. 2, above.) To be clear, those utilities did have water loss, but in the UFF data column—the one that matters from a regulatory compliance standpoint—the LMO-2 tallied nothing.

In many instances where a permittee reported zero UFF, it was also the case that they reported total accounted for flow to be more than total pumpage. (Again, see fig. 2 above.) This is physically impossible, of course, but the formula makes it appear that water is being created. When communities report that their MUL exemption, added to their total billed water, amounts to more water than they ever had to begin with, it is because the very rough estimation of their water loss dictated by MUL’s guidelines is higher than their actual loss.

REPORTING WITHOUT MUL

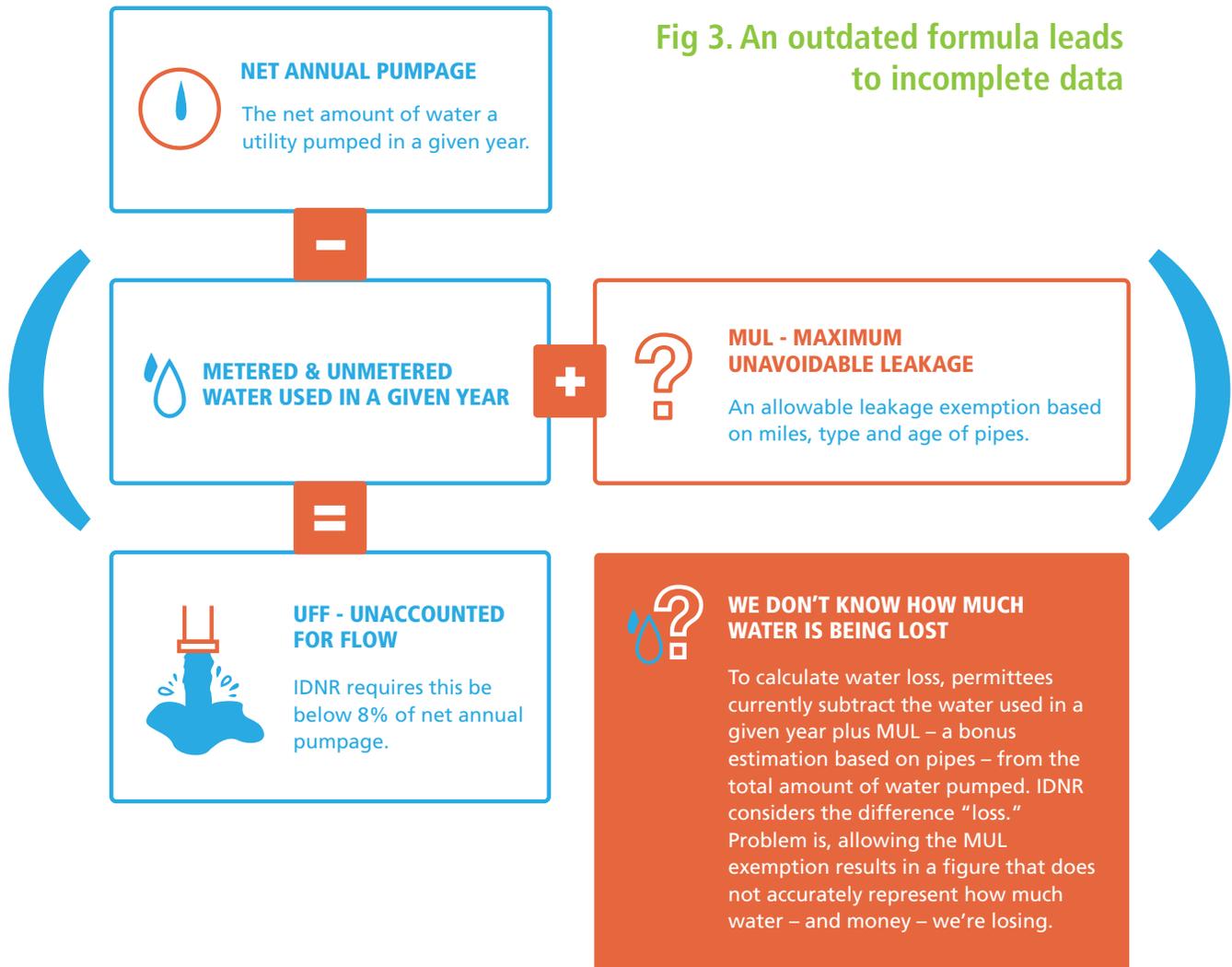


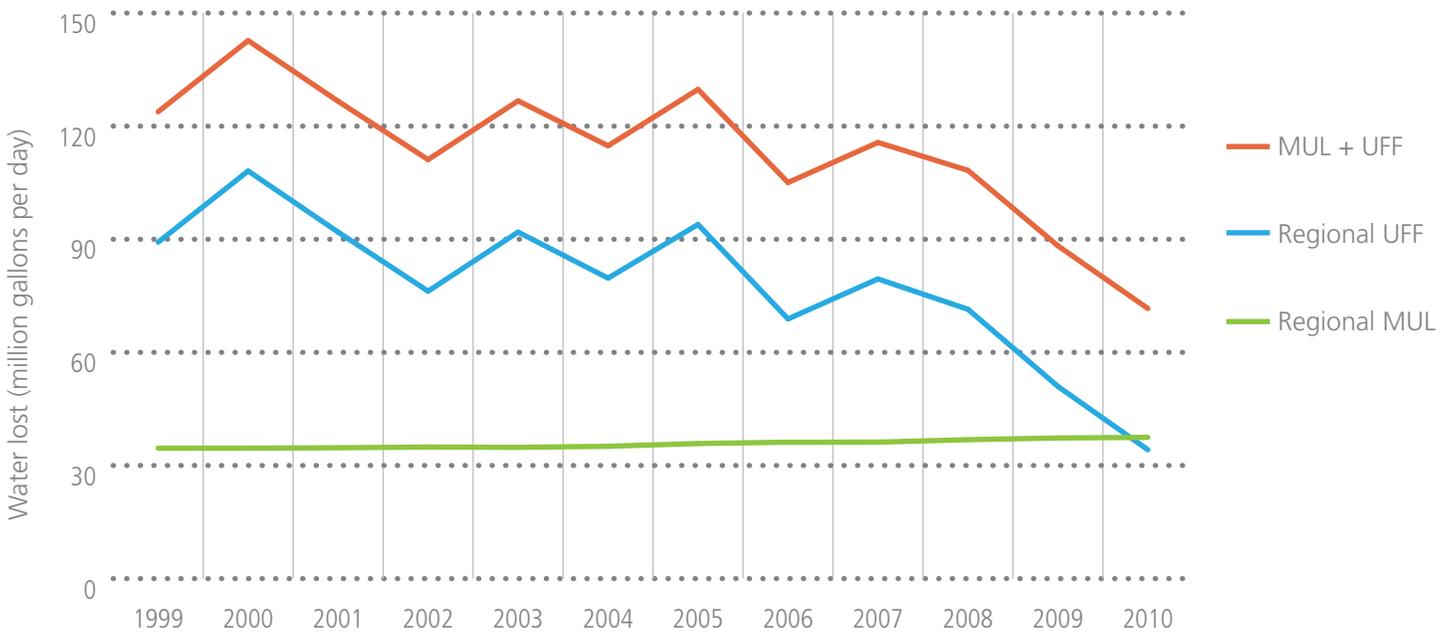
Fig 3. An outdated formula leads to incomplete data

UFF is water loss not tallied in the exempted MUL. A permittee calculates its fully allowable MUL, then adds it to water that appeared on billing records and finds that total to be less than the total pumpage figures; the difference is UFF. Between 1999 and 2010, the region’s UFF as a percentage of net annual pumpage ranged between 6.8 and 9.7 percent, before declining sharply in 2009 and 2010. As noted, Chicago’s reported water usage has a significant impact on these regional totals. Omitting Chicago, the region’s UFF as a percentage of net annual pumpage was between 4 and 6 percent every year from 1999 to 2010, gradually increasing over time. (See fig. 4, next page.) Again, we can’t put much faith in those numbers—UFF is the remainder after calculating MUL, so if the latter is off, so is the former.

Once MUL is eliminated, the remaining UFF should offer a clearer picture of the region’s water loss. Assuming this new figure will be close to past MUL + UFF, this total water loss has declined from a high of approximately 13 percent of net annual pumpage in 2000 (140 mgd) to a low of approximately 8 percent in 2010 (70 mgd). Omitting Chicago, between 1999 and 2010, the region’s total water loss (MUL + UFF) increased from approximately 9 percent of total flow to 13 percent. Because the rest of the region uses far less water than Chicago, the total volumetric loss only increased from 45 mgd to 50 mgd. However, these numbers suggest that water loss continues to grow outside Chicago, despite what appears to be declining regional water consumption. In other words, water loss is growing even as water use is shrinking.

Fig 4. Recent data reports regional water loss on the rise

Regional water loss data including City of Chicago shows declining loss



Regional water loss data excluding City of Chicago shows increasing loss

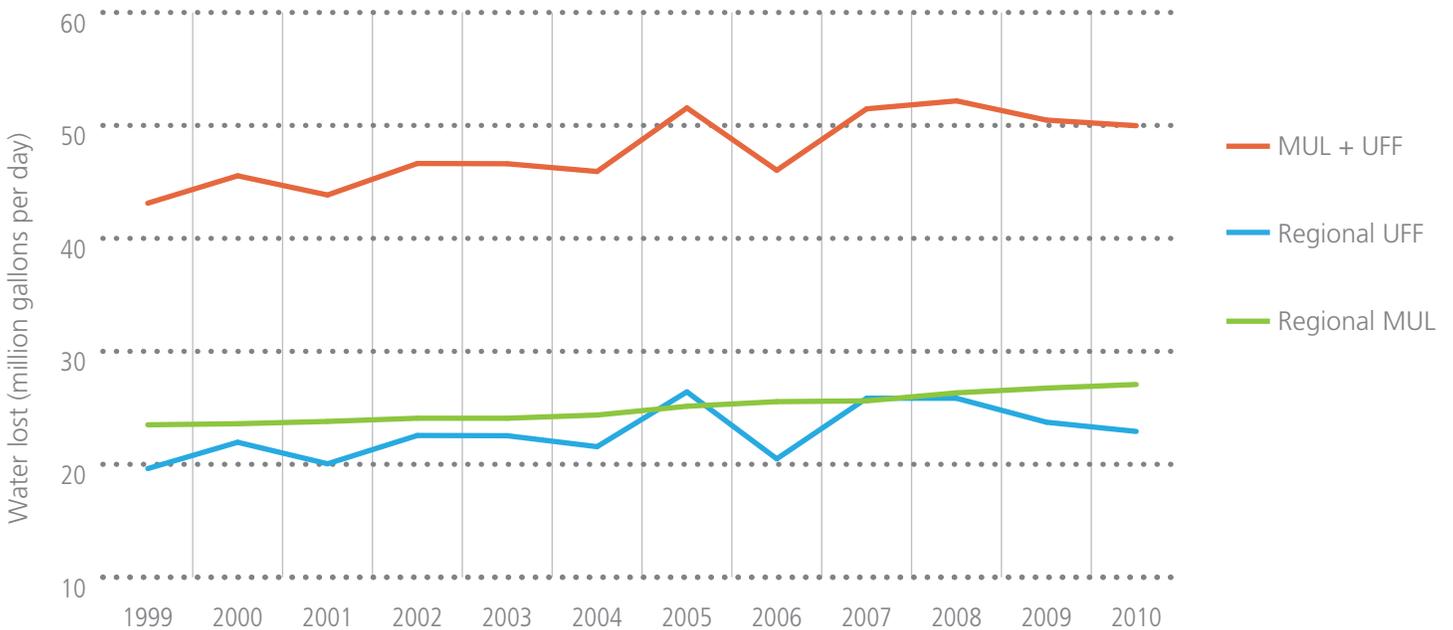
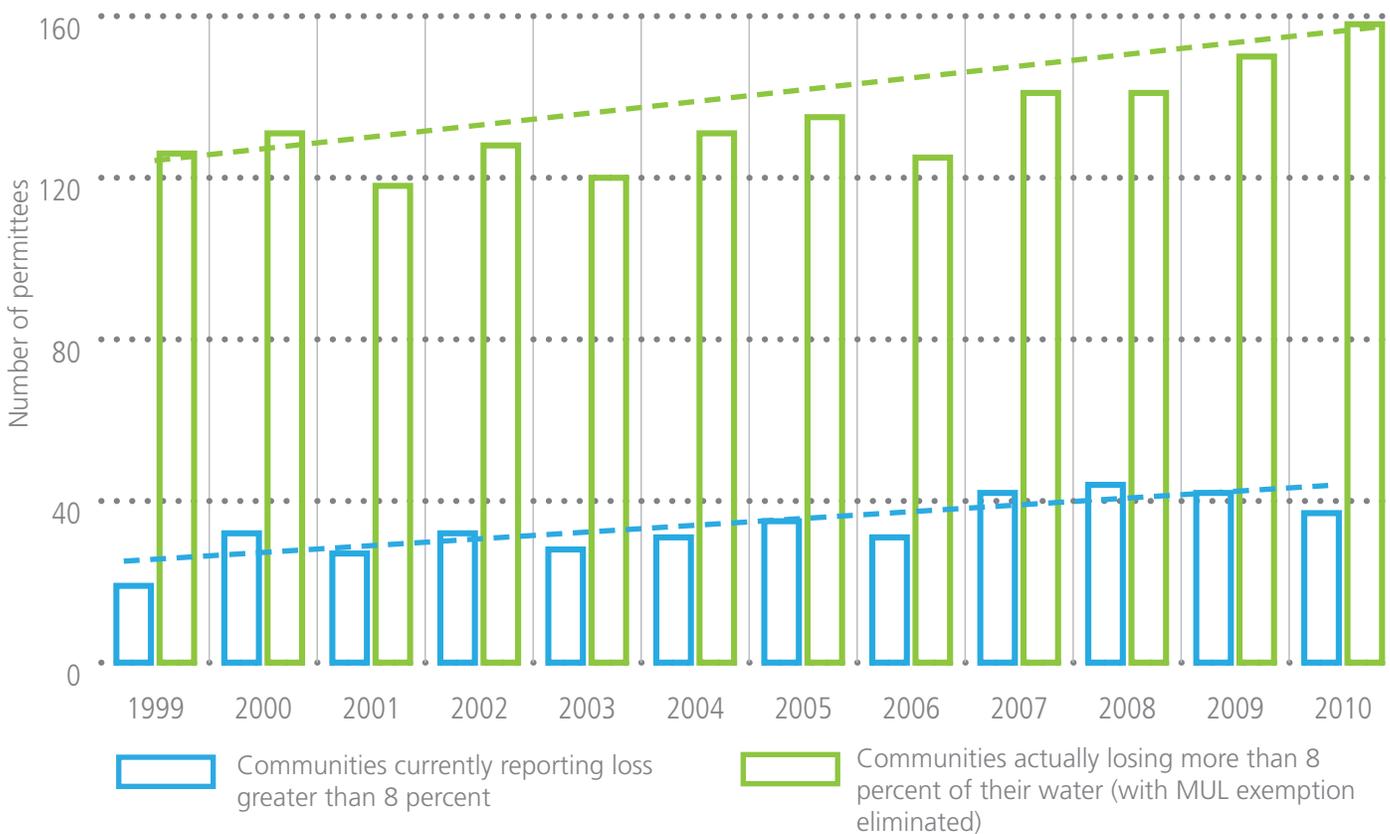


Fig 5. Modernizing formula would provide accurate assessment of water loss



Between 1999 and 2010, an average of 33 permittees per year exceeded 8 percent UFF (and with increasing frequency). Moreover, 26 utilities reported more than 8 percent UFF more than half the years under analysis.

Eliminating MUL will change this story significantly. (See fig. 5, above.) In 2010 there would have been 120 permittees with reported MUL + UFF in excess of 8 percent of net pumpage. If IDNR abandoned MUL, and all water loss was tallied under UFF, most permittees would be out of compliance with the 8 percent UFF permissible loss standard. However, Illinois also would move to a more accurate picture of the region's water loss.

IDNR should eliminate MUL, but such a basic practical shift would begin a

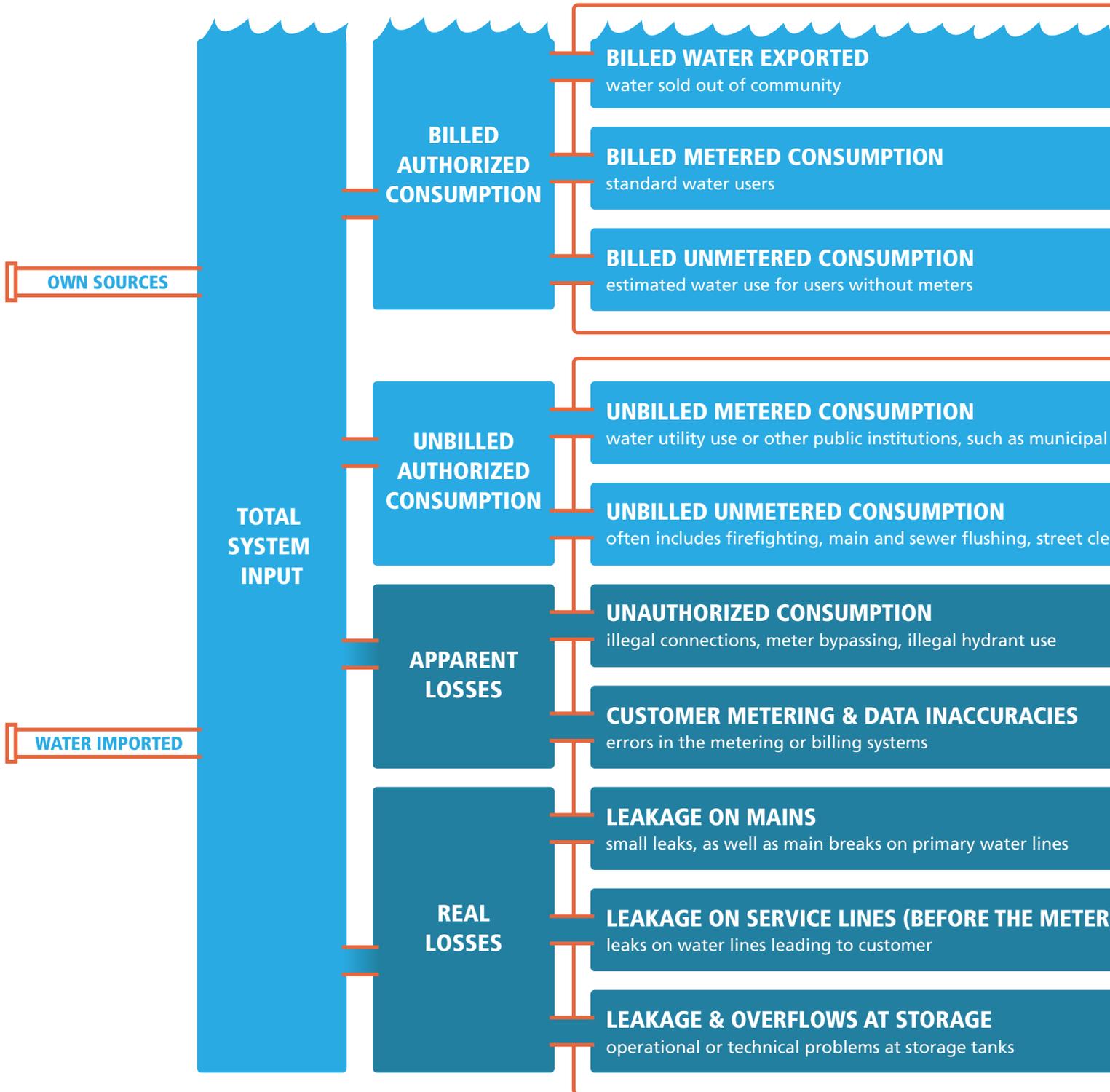
period of change and uncertainty for everyone involved in IDNR's Lake Michigan water permitting process. This should signal the beginning of an open and transparent process for the entire Lake Michigan community to get to the bottom

of what is actually happening. Therefore, IDNR should provide an amnesty period for the purpose of gathering, perhaps for the first time, truly accurate information on what is actually happening with Lake Michigan water at the local utility level. Absent a threat of fines or other punitive measures arising from the phased-out MUL exemption, and with the assurance that IDNR is improving its own ability to assist local water resource managers, the community of Lake Michigan water permittees will be more apt to deliver accurate accounting of water consumption and loss.

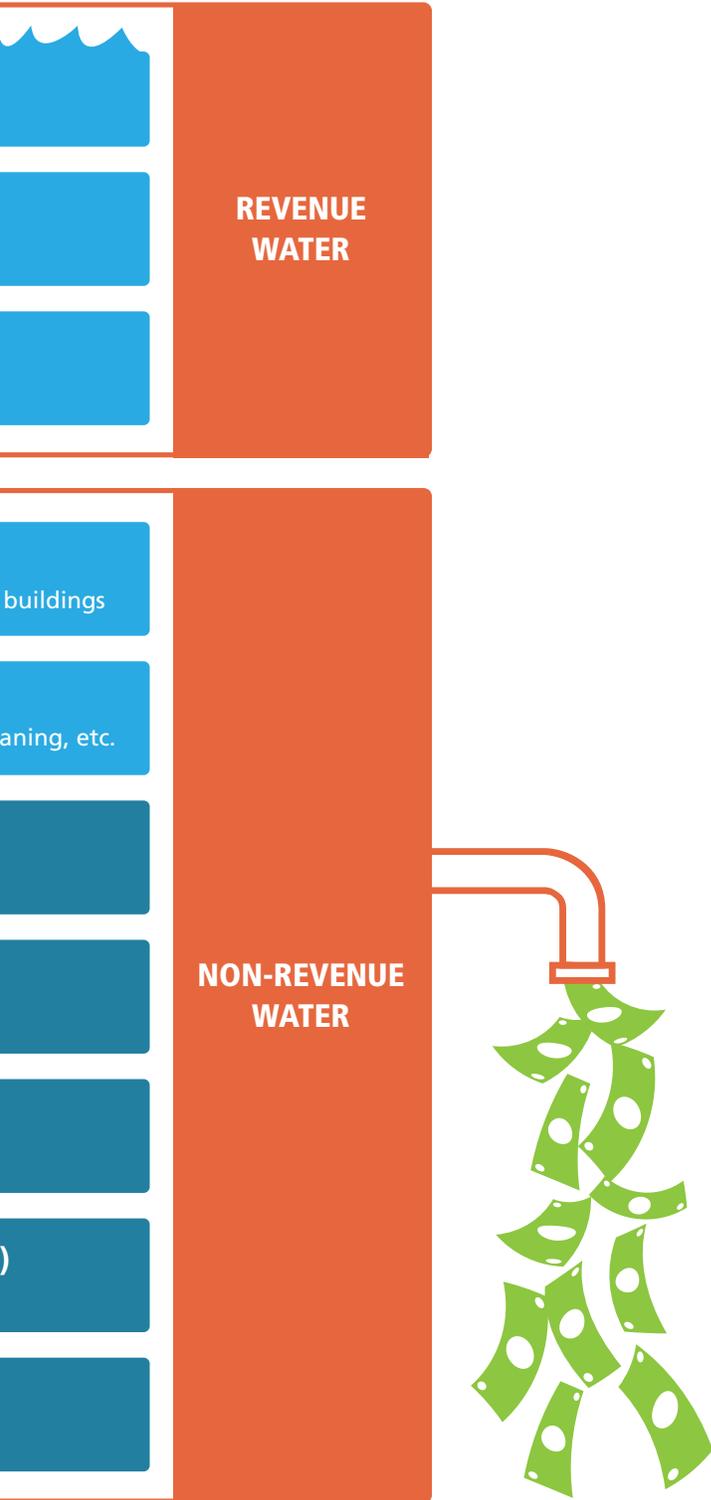


TOWARD A MORE COMPREHENSIVE UNDERSTANDING OF

Fig 6. There's more to water loss than leaky pipes



WATER SYSTEM PERFORMANCE



Eliminating MUL is a good start, but it should not be the ultimate goal. IDNR should take the following steps to put Illinois on a path to more productive and cost-effective water management.

#1 Switch UFF to non-revenue water (see fig. 6, facing page). It may sound simplistic, but the first step in asset management is simply not losing sight that there is an “asset” to be managed. Terms like “Maximum Unavoidable Leakage” and “Unaccounted for Flow” do not suggest an appreciation of treated potable water as an asset, nor of the value-adding chain of infrastructure and operations required to produce it. Such terms disassociate the information being collected from the gravity of the water/revenue-loss problem at hand, as well as from the array of possible management solutions.

Rather than trying to estimate loss through MUL and UFF, it is preferable to think comprehensively about water using two different designations: “revenue water” and “non-revenue water.” Revenue water is water that generates revenue. It is treated, pumped, billed, and ultimately the costs of each of these steps get paid for. Non-revenue water is the opposite: Water that generates costs, but no revenue, often from unbilled use, meter errors or leaks.

A utility that can understand where its non-revenue water is going can better determine appropriate processes to reduce that loss of revenue. The remedy may not always be costly pipe repair; billing errors, faulty meters or overzealous irrigation of public landscapes all can generate considerable amounts of non-revenue water and have far less expensive solutions. IDNR’s annual reporting could serve as a prompt for permittees to comprehensively audit their systems to determine causes of non-revenue water; and could collect information on important factors such as rates, revenues, costs and assets.

A deliberate shift away from words like “unavoidable” and “unaccounted for” to terms that include “revenue” has proven decisive in other regions of the country that have enacted modern water loss reporting systems (see Appendix E). Terminology matters, and

there is a compelling reason that the American Water Works Association (AWWA) and International Water Association (IWA)—the two leading organizations of water resource management professionals working to advance sustainable management practices—both use the term “non-revenue water.” Using this expression puts the focus squarely on the problem of water/revenue loss and leads to improved resource management and reduced loss.

And there is a whole lot of lost revenue out there. Taking the LMO-2 numbers for MUL + UFF in 2010 (approximately 70 mgd) and the residential rate per 1,000 gallons for each permittee that sold water, that daily regional loss had the equivalent revenue value of \$268,811 per day, or \$98,115,845 for the year. These figures represent an estimation of this water’s market value. That is not to say that fixing every leak and meter in northeastern Illinois would immediately produce an additional \$98 million in water revenue each year; repairs eliminate water and money lost through leaks, but do not necessarily mean that this same water will instead be consumed and paid for. Producing water entails costs for pumpage, treatment and distribution, and if the water is not billed, no revenue is generated. Reducing the amount of treated water wasted through leaks will provide a savings in production cost. Yes, reducing that wasteful spending will cost something—after all, pipe repairs aren’t free—but smart investment now will lead to savings in the future.

IDNR can play a more active role in shifting the thinking of water resource managers throughout northeastern Illinois by simply (but emphatically) shifting its terminology to “non-revenue water” and the mindset of asset management more generally. MPC recommends IDNR begin to make this shift as it moves to a new, modern accounting system.

#2 Determine more useful measures of quality water resource management. Non-revenue water as a percentage of net annual pumpage is important, but so are meter accuracy and automation (technology that allows meters to be read remotely, removing the need for personnel to physically read meters), rate of pipe replacement, number of main breaks, water pressure consistency, billing frequency, the ratio of costs to revenue and total gallons of non-revenue water. These factors are all relatively easy to track and report. Collecting them would put IDNR in an immensely better

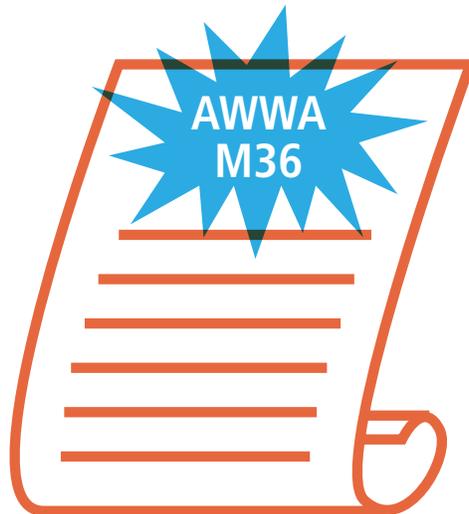
position to understand trends in water management and proactively identify issues that must be addressed. Relying solely on percentage indicators masks the region’s water loss problem, particularly if they are considered without additional context and data. For example, a utility could begin selling more water (e.g. a new business located in that service area), but not reduce its volume of loss at all, and suddenly have a lower ratio of loss to pumpage, even though no corrective action actually occurred. There are many other factors—including changes in meter accuracy or seasonal swings in demand—that could change percentages of loss without changing the actual volume and cost of that loss.

Additionally, the current standards embedded in the LMO-2 process do not truly allow communities of similar size to learn from and benchmark themselves against one another. A system like Chicago’s, with 4,200 miles of pipe pumping billions of gallons of water to millions of people within and beyond its own borders, is a very different frame of reference than the water system for a small village, such as Golf. Golf reported a 2010 population of 451, total daily water pumpage of 60,000 gallons, and 3.1 miles of pipe. Achieving a reasonable level of water loss, a productive rate of pipe repair and reliable customer service is a vastly different enterprise in a huge city like Chicago than it is in Golf. To understand whether Chicago is managing its utility well, it would need to be compared to utilities of comparable size and age. Unfortunately, no such utilities exist in Illinois; Philadelphia, Cleveland, Detroit and Milwaukee might be more appropriate, but of course, those cities’ water department staffs don’t fill out IDNR’s LMO-2 form, which is unique to Illinois. Golf, meanwhile, has more relevant local comparisons in some of the Illinois American Water service areas, or other markets with similar population, pumpage, and pipe miles.

Consider this parallel: In the automotive industry, sports cars are compared to other models of sports cars—rather than to SUVs—to determine which is the best sports car. The same is true with water utilities. Small utilities need to be able to benchmark themselves with other small water utilities and then set performance targets based on that comparison, to become better small water utilities. Medium and large utilities should do the same, and IDNR could facilitate that if it were collecting a more comprehensive array of information on system performance.



AN EXISTING ALTERNATIVE TO THE LMO-2 FORM



Fortunately for Illinois, more comprehensive methodologies are readily available. The most well-known, the **American Water Works Association (AWWA) M36** water audit methodology, forms and educational materials, allows system managers to determine the extent of their own water loss problem by asking questions about several financial and operational performance indicators. The M36 process produces an Infrastructure Leakage Index (ILI) that allows utilities of comparable size to benchmark and compare themselves against each other.

However, it will take considerable time and effort to prepare Lake Michigan permittees and IDNR for a switch from the LMO-2 to the M36 process, and longer still before any results from that process, such as ILI, can be used as numerical targets comparable to the current 8 percent UFF standard. The M36 auditing process requires high quality data collection and processing, which in turn has a strong bearing on the validity of the final ILI. The M36 requires more elaborate input and work than the LMO-2—which will come at some cost—but the final result is more useful.

IDNR already has the authority to require Lake Michigan water permittees to complete the M36 process, stemming from the same regulation that enables it to require completion of the LMO-2. MPC recommends IDNR act on that immediately, by requesting permittees complete both the LMO-2 and the M36. While M36 may prove a better tool in the long run, Illinois should take caution and not rush to replace one sys-

tem that produces invalid results—the LMO-2—with another that may do the same thing initially. Instead, IDNR and its Lake Michigan permittees should work in close collaboration with leading experts from AWWA over a multi-year period to improve all permittees' data collection and processing, while also determining appropriate ILI targets for utilities of different sizes and circumstances.

U.S. regions, states successfully using AWWA's water audit method

The use of AWWA'S M36 water audit is spreading, and the results are helping utilities identify and implement cost-efficient water loss reduction strategies. Among the regions and states that have successfully adopted this method are:

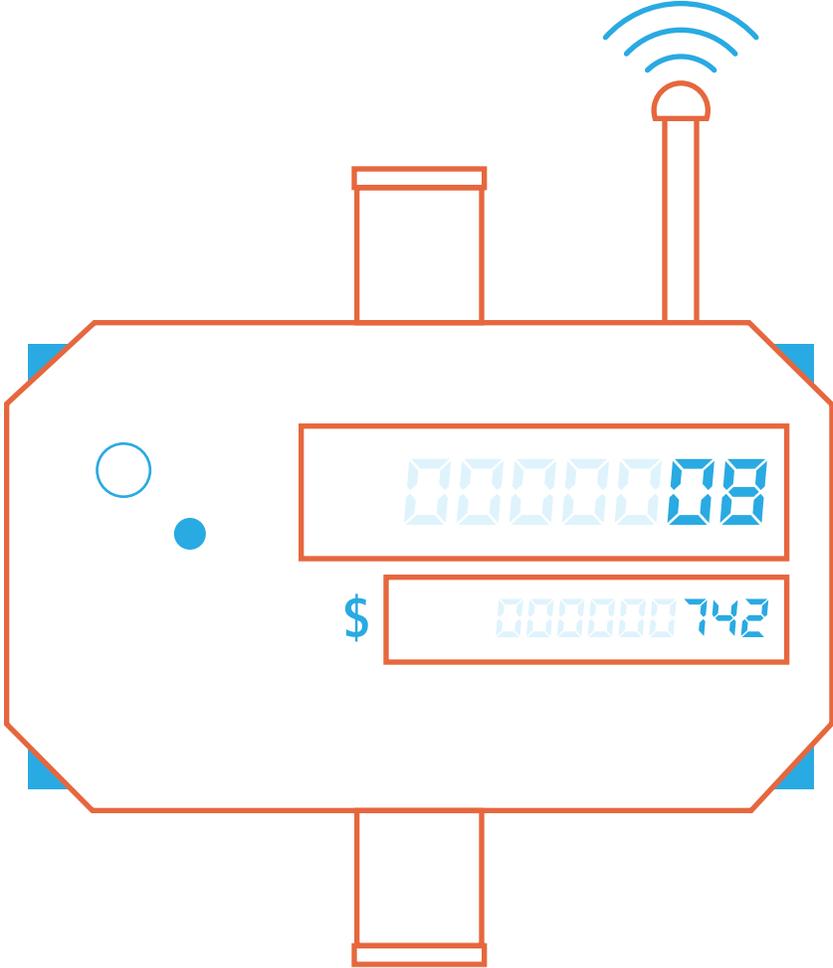
- State of Georgia
- State of Texas
- Delaware River Basin Commission
- Pennsylvania Public Utility Commission
- Tennessee Office of the Comptroller

To learn more, see Appendix E on page 43.



SOLUTION #2

Encourage communities to set water rates based on cost and use comprehensive metering



What's the problem? In many places water rates do not generate sufficient revenue to meet the costs of providing water services. Meeting those costs requires detailed information from accurate water meters, but not every building with Lake Michigan water has a meter.

What's the solution? Water utilities—both public and investor-owned—should adopt full-cost pricing in order to generate sufficient revenues for cost-effective and reliable water resource management. In the near term, IDNR should recommend use of full-cost pricing and provide guidance to permittees on a standardized cost accounting methodology, as well as rate setting. IDNR also should require incremental movement toward full-cost pricing, to be complete within the next 10 years. To ensure accurate measurement of water delivery, IDNR should require universal metering of all new and existing buildings. Until all existing buildings have a meter, however, IDNR should reconsider its proposed rule change requiring sub-meters in all new multifamily housing.

What will it achieve? Water resource managers will generate sufficient revenue from system users to operate, maintain and invest in high-quality water systems.

With a better accounting process, both IDNR and individual permittees will have much better data with which to manage Lake Michigan water. That will prompt more system maintenance and improvements, which will entail higher costs; it is important to remember that while loss and waste come at a cost, fixing those sources of inefficiency does, too. Fortunately, water rates and other revenue generators provide a generally dependable revenue stream for meeting those costs, assuming that rate structures are designed to recoup the full array of costs. Unfortunately, today many utilities do not set rate structures to meet those full costs. As a result, regular maintenance often gets delayed and water systems deteriorate, exacerbating water loss and other problems.

According to the *Full-Cost Water Pricing Guidebook for Sustainable Community Water Systems* released in 2012 by the Chicago Metropolitan Agency for Planning (CMAP) and Illinois-Indiana Sea Grant (IISG), “recovering the full cost of providing water service is fundamental to addressing both the need for investment in water infrastructure and the challenge to accommodating millions more residents in livable communities by mid-century.” To be able to sustainably fund operations and ongoing maintenance, utilities should price the water they produce properly, which means charging rates that reflect the full cost of water services.

IDNR's proposed rule changes include a recommendation that all rate-setting permittees adopt full-cost pricing; MPC supports this measure. However, without additional guidance on how to account for the full range of costs they must deal with—operations, debt, capital investment, etc.—some permittees may struggle to develop appropriate financial benchmarks. IDNR should work with such existing partners as CMAP or IISG to build the region's capacity for use of standardized accounting procedures, which will inform revenue requirements and rate setting. Permittees should take incre-

mental steps toward full-cost pricing, with full adoption in the next 10 years.

Determining revenue needs and designing water rates to provide funding for the full array of costs required to produce clean, reliable water gives utilities a more reliable means of maintaining infrastructure. This reliability allows utilities to plan for systemic asset management over the long-term, rather than in a piecemeal, reactionary way, simply responding to main breaks and external funding opportunities as they arrive.

Establishing full-cost pricing as a viable revenue stream means more than just setting rates at a certain number. The first step is to identify what needs to be paid for. This includes providing a certain amount of water to current and future populations, maintaining water quality at levels required by state and federal law, repairing infrastructure on a regular basis, building new infrastructure as necessary, paying off debt, providing the level of customer service desired by customers and more. When identifying costs, the goals and objectives of the utility must be taken into account. For example, how quickly should repairs be done? How much water loss can feasibly be eliminated? How proactive does the utility want to be in promoting efficiency, encouraging water-intensive economic development or planning for future growth? Does the utility want to promote certain consumption patterns by raising rates during the summer when there is more demand, or by establishing lower rates for basic consumption and higher rates for discretionary uses?

One of the biggest worries for utilities in setting full-cost rate structures is that higher rates may encourage water conservation, and thus reduce sales and revenue generation. However, according to the price elasticity of water, price increases may reduce consumption but lead to overall increased revenue.

Programmatic conservation efforts reduce consumption to the point that revenues fall (which is to say that conservation programs should be used prudently and with foresight). Beyond immediate revenue impacts, reduced consumption may delay or negate the need for costly expansion projects, delivering savings in the long term. Improvements in system performance may reduce waste, lowering costs in the short term. Rate structures can be created to cover fixed costs with a fixed charge, and variable costs with a supplementary variable charge. And metering upgrades may reveal unknown sources of non-revenue water. All of this, clearly, is complicated and nuanced. IDNR will need to build its own capacity and work with partner organizations to provide advice on best practices for full-cost pricing.

The role of metering in accurate, timely data collection cannot be overlooked. We can't manage what we don't measure. The City of Chicago's metering gap—approximately 300,000 single-family and two-flat homes do not have water meters—is well known, and judging only from the LMO-2 data, it would appear that only Chicago has a substantial metering gap to address. Very few other permittees report any unmetered use, and then only for very small percentages of their total accounts. However, the information from the LMO-2 forms differs from a 2008 survey of north-eastern Illinois water utilities by CMAP, which estimated that 38 percent of utilities in the region do not have fully metered systems. That survey included groundwater and river water communities, but the map (fig. 7, facing page) demonstrates that communities reporting less-than-fully metered systems exist throughout the region, regardless of water source, including many in Cook and DuPage counties that use Lake Michigan water. The survey information was self-reported by the region's utilities. The LMO-2 forms—also self-reported by the region's utilities, but to a regulatory body—do not tell the same story. In 2008 only seven permittees (out of approximately 200) reported any unmetered residential water on their LMO-2, with comparable reporting tallies for commercial, construction and municipal uses. The communities on the map (see fig. 7, facing page) and in the LMO-2 forms are not consistent with each other. While it is unknown which data are more accurate, this discrepancy represents another example of our region not truly knowing what is happening with our water resources.

IDNR's existing permit conditions require installation of meters on new and rehabilitated buildings, which does little to prompt permittees with a metering gap to address it. This

should be the immediate priority. IDNR should require that within two years permittees without universal metering develop a plan for covering that gap within 10 years. Furthermore, IDNR should work with CMAP to compare the results from CMAP's study and LMO-2 information to determine exactly how wide the region's metering gap truly is, and provide targeted assistance to permittees struggling to either plan for or implement universal metering. It is worth noting that meter installation is an eligible expense of the Clean Water Initiative, a low-interest loan made available through the IEPA. IDNR's metering focus for the immediate future should be to ensure that every existing and new building in the Lake Michigan service area has a functioning, accurate meter.

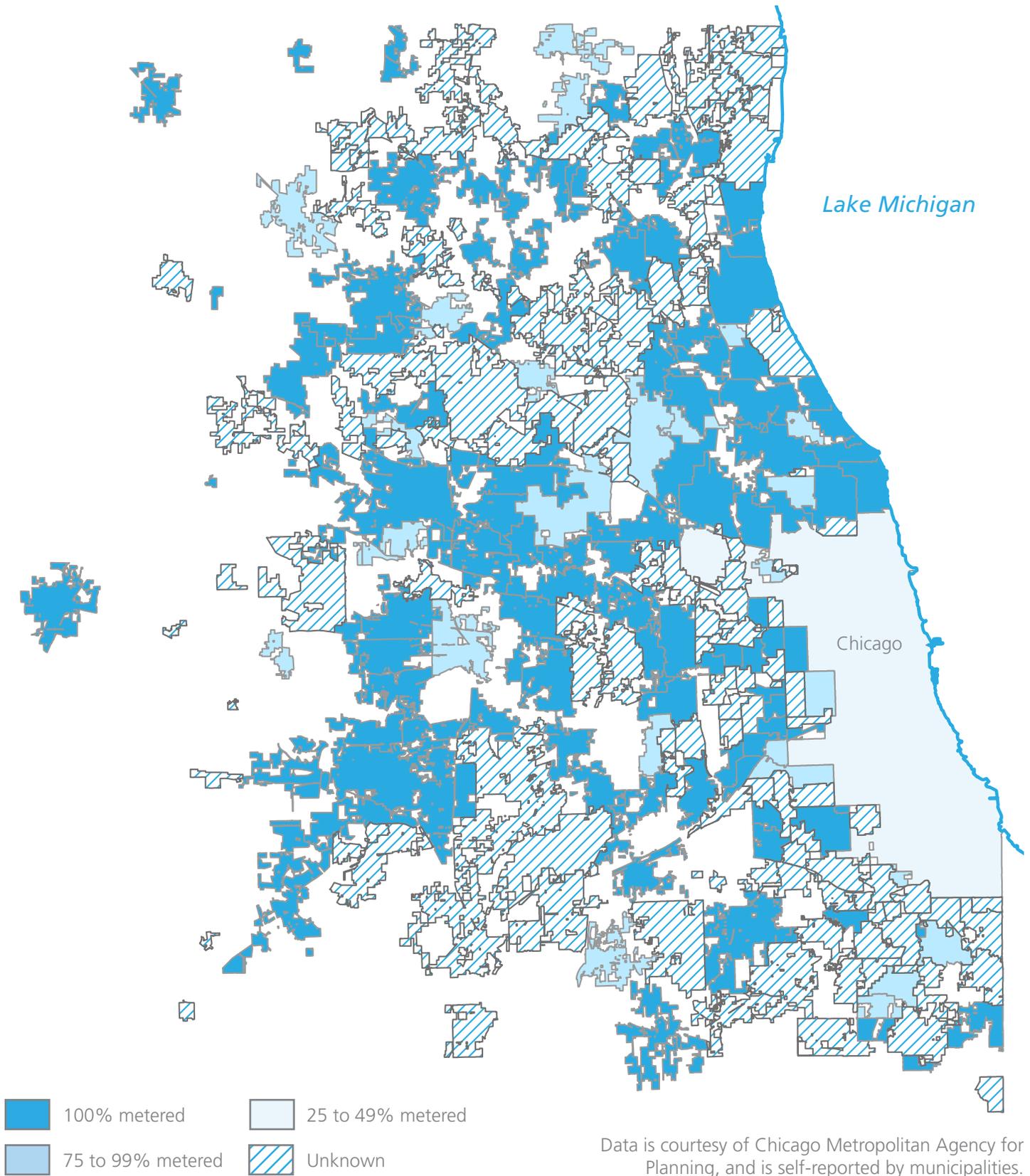


This represents a point of divergence between MPC and IDNR, whose proposed rule changes would include mandatory sub-metering in all multifamily buildings in new construction. Sub-metering is a good policy, and can promote more efficient usage by individual users, but should not be a requirement at this time. In general, residents of multifamily buildings have consistent and relatively low water usage trends, with little in the way of outdoor water uses that lead to summertime spikes. Metering these users individually reminds them of their role in shared water resources challenges but may not improve water resource management in proportion to the cost

of implementation. IDNR should recommend sub-metering, without requiring it (similarly, IDNR should recommend, but not require, the use of advanced, remotely read meters). It is worth noting that most leading plumbing codes also include voluntary provisions on sub-metering; IDNR can simultaneously promote sub-metering while promoting these codes. In either event, given its capacity constraints, IDNR should focus its efforts where they have the most cost-effective impact; and in the area of metering, that means resolving the existing metering gap.

Full-cost pricing is already the norm for Illinois' highly regulated investor-owned utilities, and should become the norm for all utilities to manage our finite water resources better. That requires universal metering to generate timely information for both users and utilities. In an era where federal government no longer funds this kind of capital investment through grants, only loans which need to be repaid, full-cost pricing enables fiscal responsibility and reliably balanced budgets to pay for operations, capital costs, debt repayment and infrastructure maintenance.

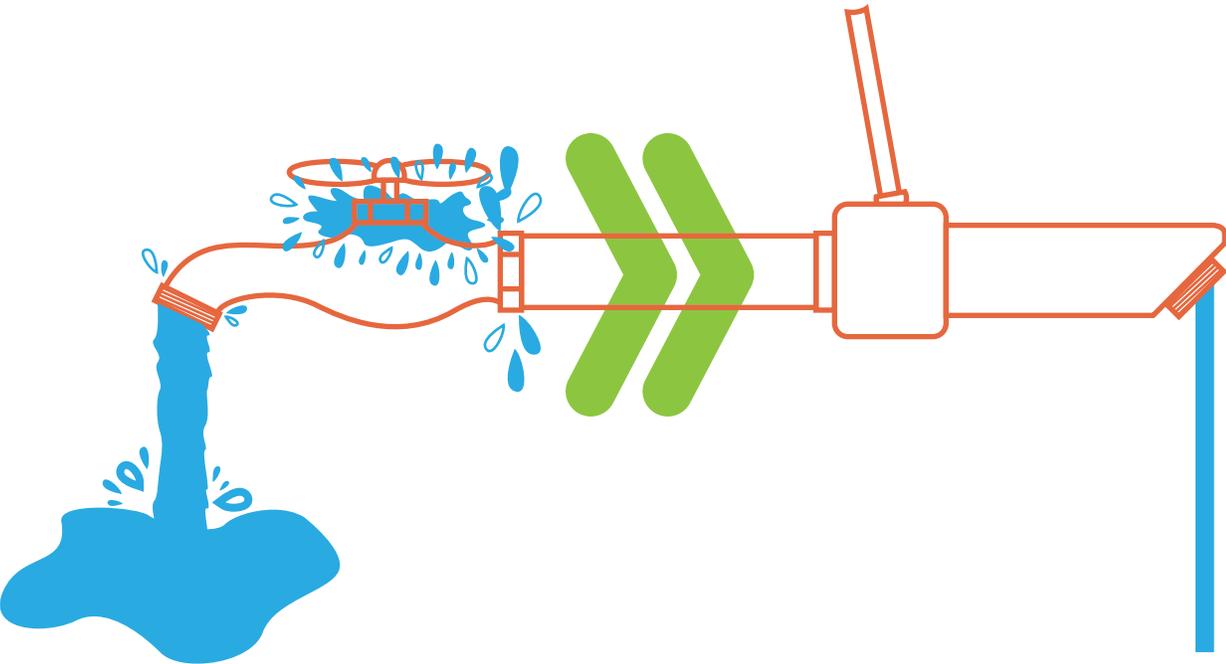
Fig 7. Region far from goal of universal metering





SOLUTION #3

Require permittees to adopt modern plumbing standards



What's the problem? A lot of treated, potable water is wasted as a result of inefficient plumbing. In many instances, non-potable water would have done the job just as well.

What's the solution? IDNR should move ahead with its proposal to require permittees to adopt more modern plumbing codes, requiring the use of water-efficient WaterSense plumbing fixtures for new installations. Further, IDNR should recommend permittees adopt local codes modeled after the forthcoming Illinois Plumbing Code Green Supplement from the Ill. Dept. of Public Health (IDPH), or more frequently revised model codes from multiple national professional organizations. Finally, IDNR should coordinate with the Ill. Environmental Protection Agency and IDPH to develop a statewide non-potable water reuse policy that protects public health and water quality while putting available water resources to more productive use.

What will it achieve? Collectively, these reforms will put Illinois on the leading edge of plumbing technology, to ensure the most efficient use of water in homes and businesses.

Plumbing—toilets, faucets, shower heads and so on—plays a major role in how efficiently individuals, homes and businesses use water. In the past two decades, the efficiency of plumbing technology, systems and operations have improved considerably. The result: Less water is wasted today even as consumers and businesses continue to do day-to-day tasks such as cook meals, flush toilets, run businesses and irrigate crops.

Rising costs for producing drinking water and the increasing scarcity of water suitable for treatment are driving experimentation and innovation in plumbing—and opening up new opportunities for harnessing water that currently and needlessly goes to waste, such as rain that runs into sewers, lightly used water from laundry machines and bathroom sinks and air conditioning condensate. Instead, we are starting to capture, clean, store and use such water for non-drinking uses, such as indoor fire sprinkling systems and flushing toilets.

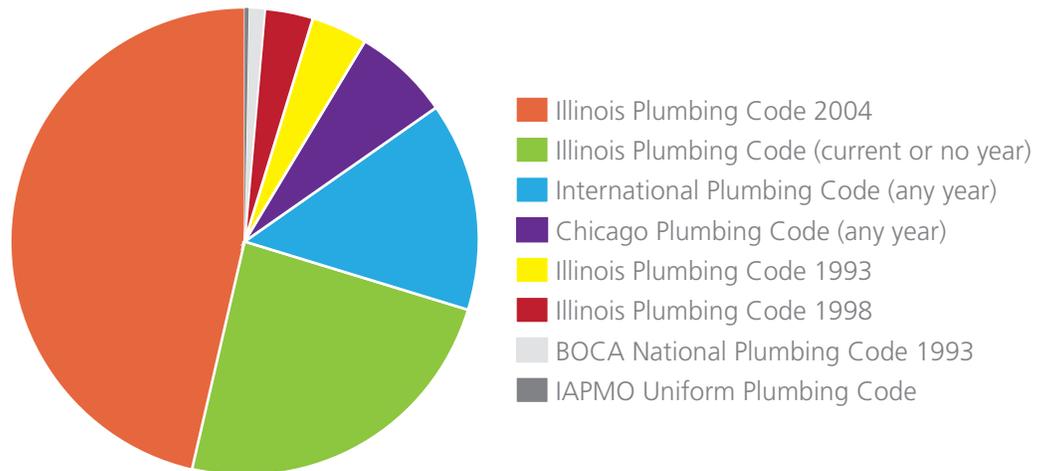
In Illinois, minimum standards for safe and effective installation and operations of plumbing systems are set by the Ill. Dept. of Public Health (IDPH). Illinois, unlike most states, writes and modifies its own plumbing code, a time-con-

suming process. Thus, revisions and modernizations are too infrequent to keep pace as modern plumbing evolves. For example, Illinois' plumbing code does not set standards for the reuse of non-potable water; these systems can be installed only by obtaining a variance. Local units of government may adopt stronger, more stringent plumbing standards at their discretion. Within the Lake Michigan permit conditions, IDNR also requires specific fixture efficiency ratings to be used locally, and in its proposed rule changes requires that U.S. Environmental Protection Agency (U.S. EPA) WaterSense-labeled products be used when available.

Most other states use a model plumbing code from one of two organizations—the International Code Council (ICC) or the International Association of Plumbers and Mechanical Operators (IAPMO). In fact, several Illinois municipalities also adopt codes from those organizations (in whole or in part) as a superseding overlay to the Illinois Plumbing Code. (See fig. 9, next page.) These two organizations update their codes frequently, so both models reflect the current leading edge of plumbing technology. State or local jurisdictions using these models can readily adopt the newer language, to ensure that regulation and technology are aligned.

Fig 8. Inconsistent local plumbing codes based on outdated state codes

Municipalities currently employ a wide range of plumbing code variations. The 2013 Illinois Plumbing Code update will offer modern guidelines upon which communities can standardize.



At the time of writing this paper, IDPH was in the process of adopting a set of revisions to the Illinois Plumbing Code. This was partially driven by a recognition that efficiency standards for many plumbing components have improved significantly; and partially because for several years a group of advocates—including MPC—have been encouraging codification of standards for non-potable water reuse to reflect the fact that many Illinois homeowners, business owners, real estate developers, architects, and units of government (the City of Chicago and Lake County in particular) have expressed substantial interest in building systems designed to harness and reuse wasted water.

It has always been the case that IDPH will grant variances from the Illinois Plumbing Code for non-potable water reuse systems that its staff deems safe and dependable; as a result, many such systems exist in Illinois. However, the variance process is time-consuming. For individual homeowners, smaller units of government, and other entities without staff to devote to the matter, requesting such a variance may be an untenable burden. The code update (expected to be complete in mid-2013) will be a step in the right direction toward unlocking the potential of non-potable water reuse. However, the technology for those systems will

continue to evolve, and it remains to be seen whether the planned code revision will have a mechanism for regular updates to keep pace with developments in non-potable water reuse technologies.

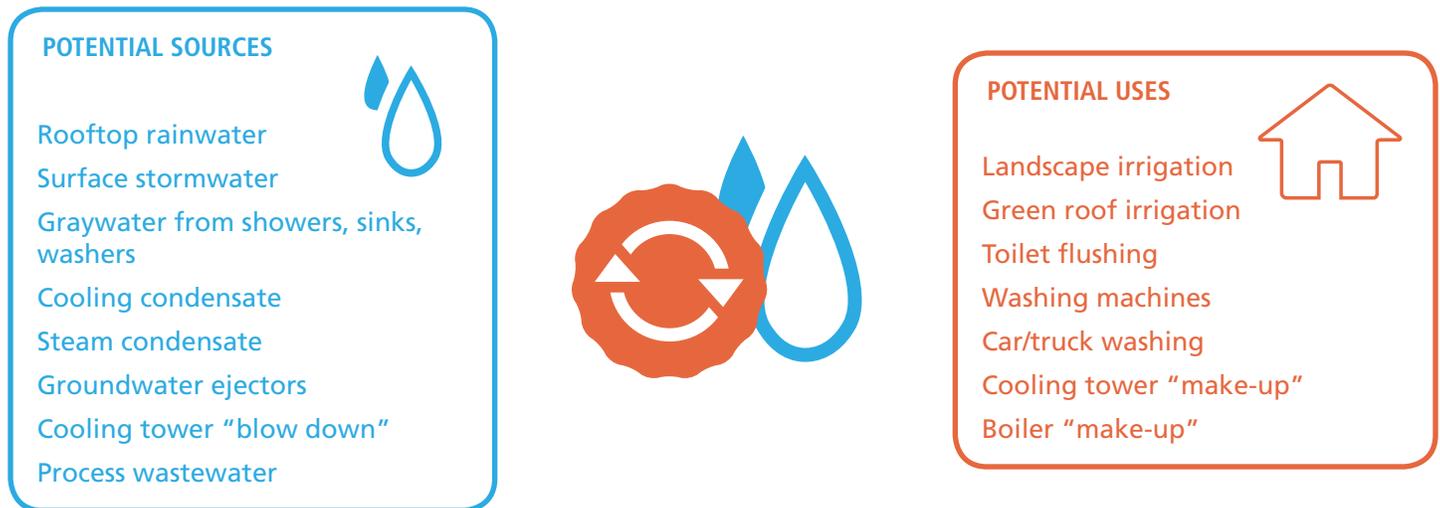
The standards for non-potable water reuse are expected to be part of a “green plumbing supplement” to the State’s updated plumbing code, which also will include standards for more efficient plumbing fixtures, like WaterSense-labeled fixtures. This supplementary code language will not mandate the use of efficient plumbing fixtures or non-potable water reuse systems in new or renovated construction, but will simply lay out the appropriate protocols for using them if a property owner chooses to install them.

For non-potable water reuse systems, the proposed relegation to the voluntary green supplement is appropriate; property owners should not be forced to have them, but if they want one, certain safety precautions must be taken. However, the use of more efficient plumbing fixtures should be mandatory, not voluntary, under the updated code. In older homes and businesses, one can still

find toilets that use upwards of five gallons per flush. Years of regulatory change and technological innovation have reduced



Fig 9. Many ways to collect and reuse non-potable water



Courtesy of Water Harvesting Solutions, Inc.

that substantially—WaterSense toilets now use 1.26 gallons per flush and perform excellently. IDPH will miss an opportunity to substantially improve Illinois’ water resource management if those new efficiency ratings remain voluntary.

IDNR also can address obsolete plumbing standards. Its current Lake Michigan permit conditions require local jurisdictions to use codes with plumbing fixture efficiency ratings so obsolete and outdated that one would be hard-pressed to find such an inefficient fixture at any store in 2013. IDNR has proposed requiring permittees to install water-efficient WaterSense plumbing fixtures for new installations, which is a good start. However, IDNR can do more by requiring or strongly recommend that permittees use either the forthcoming “green plumbing supplement” from IDPH, the latest ICC or IAPMO model codes, or a locally drafted code of comparable rigor and scope. IDNR also should require that all permittees review their local codes on a regular basis to ensure consistency with leading technology and practices. IDNR should assist in this process by disseminating information about code innovation on a regular basis. It remains to be seen how frequently the Illinois Plumbing Code will be revised in the future, but ICC and IAPMO adjust their standards on a regular basis, and Illinois could take its cue from them. IDNR can track local code compliance through a publicly available database at relatively little cost. All of these steps would give IDNR the opportunity to create regional demand for efficient plumbing fixtures simply by better matching regulation to technology.

IDNR also has a role to play in the future of non-potable water reuse. In Illinois, IDNR focuses on water supply man-

agement, IDPH focuses on the public health ramifications of plumbing systems (as well as small wells, swimming pools and other facets of water resources management), and the IEPA focuses on water quality concerns to ensure compliance with the U.S. Clean Water Act, Safe Drinking Water Act, and other statutes. Non-potable water reuse truly is the domain of all three agencies, and yet there is little dialogue and even less policy consensus between them.

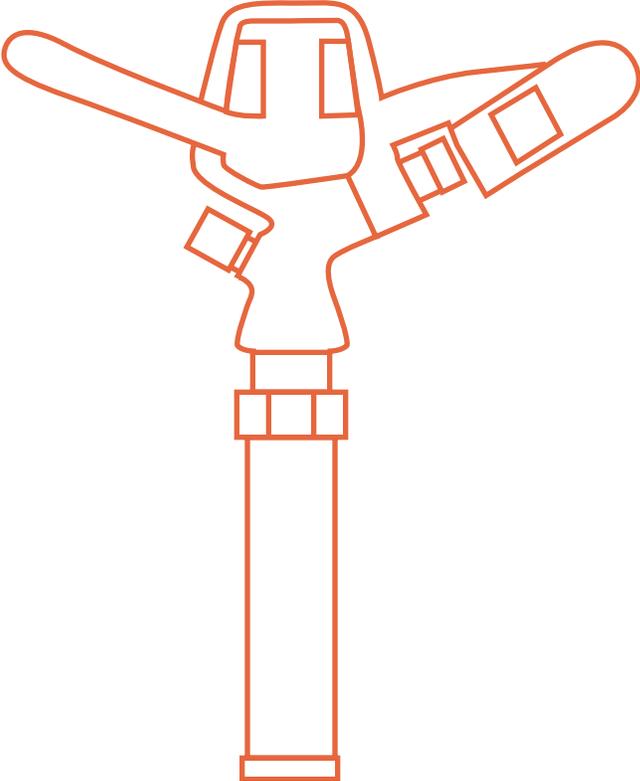
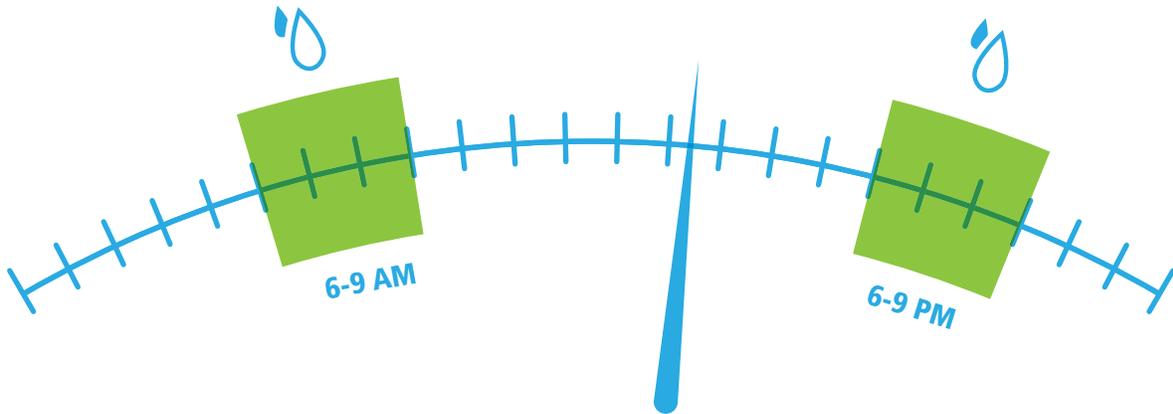
However, the field of non-potable water reuse—essentially turning nuisance water into a resource—holds great promise: Beyond household systems to harvest rain or reuse relatively small amounts of graywater, possibilities include utility-scale recycling and distribution of wastewater effluent, aquifer or watershed recharge using effluent or rainwater, comprehensive retrofits of power production facilities to reduce river withdrawals for coolant water and using reclaimed water for natural gas extraction.

These emerging opportunities are not clearly within the purview of any one state agency. They are matters of water quality, public health and economic development, all at the same time—but primarily an issue of water supply, and that puts the onus on IDNR to take the lead. Moreover, IDNR already plays a large role in facilitating inter-agency coordination on water issues, and its role in managing Illinois’ work within the Great Lakes Compact gives it ready access to other states grappling with the same issues. IDNR’s Office of Water Resources should take the lead in coordinating an inter-agency effort to develop a non-potable water reuse policy in Illinois that protects public health and in-stream (i.e. river) water quality, while putting available resources to productive use.



SOLUTION #4

Strengthen and streamline outdoor water use standards



What's the problem? A lot of treated water is wasted on discretionary outdoor water uses. Current policies to encourage more efficient outdoor use are inconsistent and insufficient.

What's the solution? IDNR should implement its proposals to strengthen the sprinkling ordinance permittees must implement by modifying the sprinkling requirement to add time-of-day and days-per-week restrictions and to require new/replacement sprinklers to have a WaterSense-labeled irrigation controller. Further, IDNR should look to the Northwest Water Planning Alliance or Chicago Metropolitan Agency for Planning's (CMAP) Model Water Use Conservation Ordinance as regional models for progressive action on discretionary outdoor water use.

What will it achieve? These changes will help reduce permittees' peak demand for water, which in turn will alleviate the consequences of droughts, reduce the need for communities to make capital expansions to their water systems and possibly even allow communities to reduce their requested allocations of Lake Michigan water, freeing up water for other users—and regional growth.

The drought of 2012 exposed for many Chicago-area communities how severely summer water use can overtax their water systems. Water utilities typically are designed to manage peak, or maximum, water demand, much like our roads and transit systems are designed to carry rush hour traffic. In the United States, peak water demand occurs in the summer, predominately from lawn watering.

Lawn watering is a discretionary use of water that's been treated to drinking water standards, and automatic sprinkling systems are particularly prone to waste. It's also highly visible, so regulations are easier to enforce than for indoor water uses and there is great opportunity for public education to change behavior. Because lawn watering often causes peak water use to spike, utilities commonly place restrictions on the number of hours, times of day and methods used for watering, to reduce the use of treated water for outdoor use. Especially in communities that obtain water from sources susceptible to fluctuations in precipitation (such as surface waters or shallow aquifers), or capped at a certain amount as Lake Michigan permittees are, this is a smart way to reduce demand for treated water during the summer to alleviate the consequences of drought.

For many communities, however, the most compelling argument for regulations to reduce peak water demand is an economic one: If a utility can reduce its summer water demand, and in turn its maximum water needs, it often can delay capital expansion of its system, or even avoid that expenditure altogether (expansion should not be confused with maintenance of existing systems). It is even possible that better lawn watering rules could allow a community to reduce its requested allocations of Lake Michigan water, which also would lead to considerable financial savings.

Through its current permit conditions, IDNR requires that all Lake Michigan permittees adopt "ordinances which restrict non-essential outside water uses to prevent excessive, waste-

ful use." Such ordinances must put in place, as a minimum, some sort of restriction on automated lawn sprinkling systems between May 15 to September 15 each year. IDNR historically has offered no further guidance, such as recommendations for the most effective sprinkling policies or enforcement; nor does the LMO-2 form track information about permittees' sprinkling ordinances or enforcement. This leads to two significant problems:

#1 Ineffective local sprinkling ordinances. The ordinances most Lake Michigan permittees have are not particularly strong from an efficiency perspective, not straightforward to monitor and enforce, and not "in accordance with the best modern scientific knowledge."

#2 No regional coordination to reduce discretionary outdoor water use. The sheer variation in ordinances between communities speaks to a lack of a regional vision for efficient water use—and makes it impossible for IDNR and permittees to develop shared educational programming, signage and other strategies to support these ordinances.

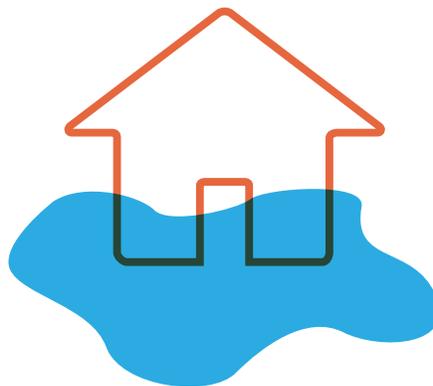
According to the University of Illinois Extension turf grass program, northeastern Illinois lawns need just one to one-and-a-half inches of water per week, including rainwater, to remain in good condition. Using modern sprinkler systems, this translates to roughly two hours of watering per week, including rainfall. This watering should occur infrequently, but penetrate the soil deeply to develop deep root systems, and in turn, healthy grass. However, many ordinances allow for some sprinkling to occur every day, or for a given number of hours, which gives many property owners the false notion that they should sprinkle every day and for many (or most) of those hours. Limiting the days of the week and hours available for sprinkler system usage will help spur efficient turf and water management.

Coordination between nearby water utilities can be very effective: In 2012, the Northwest Water Planning Alliance (NWPA), a group of roughly 80 municipalities across DeKalb, Kane, Kendall, Lake and McHenry counties that use primarily groundwater and river water, voted to recommend a uniform lawn watering ordinance for all their member communities (see Appendix D). It mandates that sprinkler systems may only be used three or four days a week, for up to 18 or 24 total hours. That closely matches the region's most forward-thinking ordinances currently in use, while simultaneously giving property owners ample amounts of time and flexibility to deliver one-and-a-half inches of water and two hours of sprinkling (including rainfall) per week. The CMAP Model Water Use Conservation Ordinance is even more conservation-driven, setting two, two-hour windows per week in which any given sprinkling system can be in operation, and has received accolades from the Alliance for Water Efficiency.

Ordinances in the Lake Michigan service area pale in comparison. First, of the 200-plus permittees, 165 are municipalities that should have some sort of sprinkler system ordinance publicly posted; 21 do not. Most municipalities post their full set of codes and ordinances on their websites, including detailed information about sprinkler system usage. These 21 communities either have online codes with no mention of sprinkler system restrictions or have not posted codes or other guidance at all.

Second, of the 144 municipalities with posted ordinances, only 35 restrict available sprinkling hours to fewer than 50 hours a week. Nearly half permit 70 to 130 hours of summer-time sprinkler usage per week, out of a total of 168 hours in a week. This is inconsistent with water conservation goals, unnecessary for meeting the demands of turf grass, at odds with leading practices and simply not the most productive use of treated water.

Existing ordinances are also inconsistent: Among the 144 municipalities with posted ordinances, 42 different time schemes exist. Confusion likely results from variability: "Why can they use their sprinklers over there if I can't use mine over here?" The larger issue is that each community must develop its own signage, education materials, enforcement practices and so on. This is inefficient. With a shared ordinance in place, IDNR and its permittees could coordinate to develop and deploy common materials and practices. This is what the NWPA intends to do to preserve groundwater and Fox River resources, and the Lake Michigan communities should follow suit.

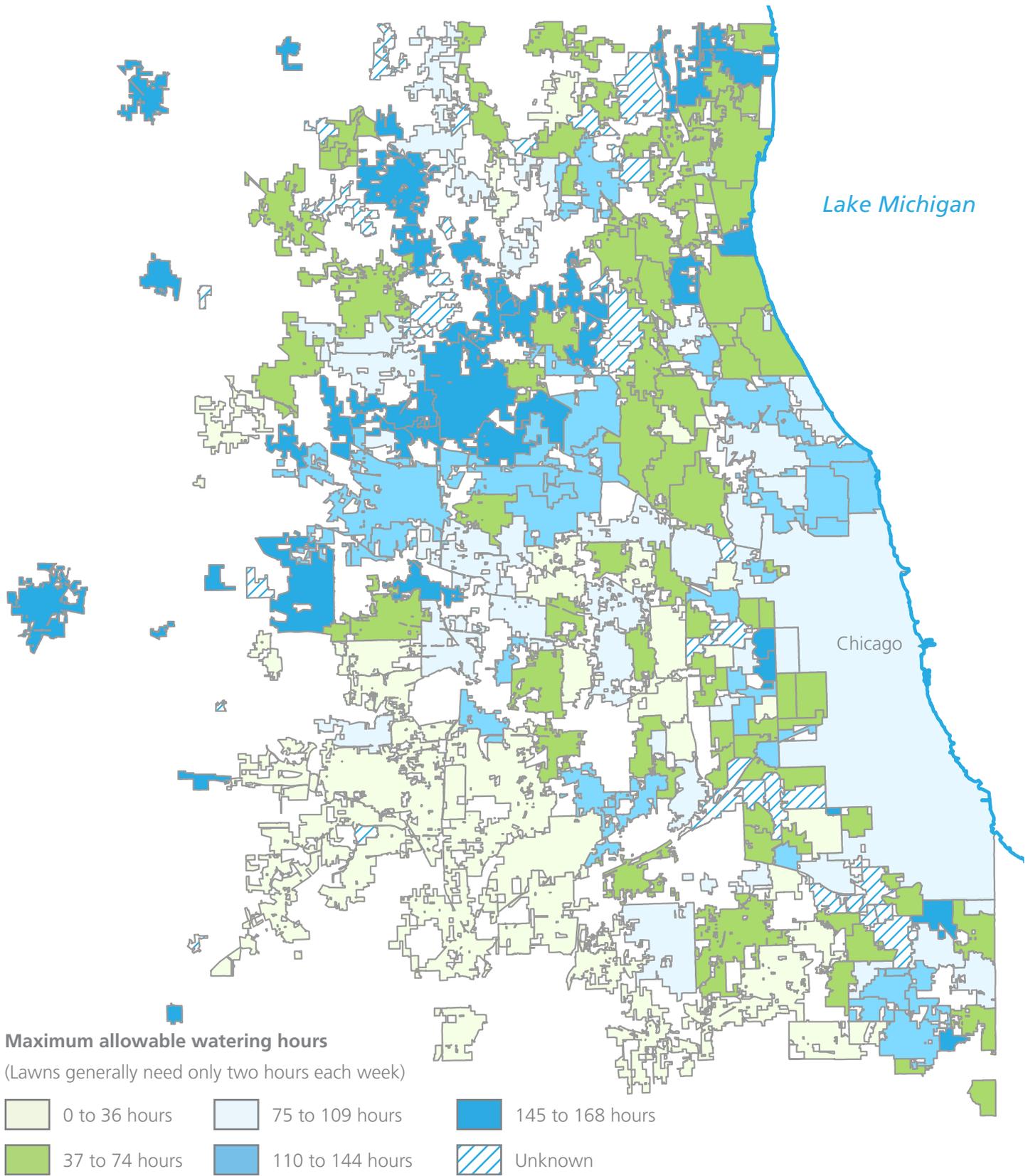


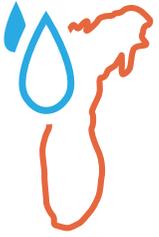
IDNR's proposed rule changes suggest adding time-of-day and days-per-week requirements to lawn watering ordinances. While this is a good step forward, IDNR should follow the lead of the NWPA to go further with ordinances. NWPA's ordinance has the added benefits of 1) providing more guidance and outreach support for reducing water use to only what is necessary, 2) enabling the use of alternative sources of water for outdoor use and 3) providing flexibility to proactively respond to drought conditions. IDNR should amend its permit conditions and reporting processes to require the following:

- All Lake Michigan communities adopt a municipal ordinance at least matching the standard developed by the NWPA. Full details are included in Appendix D. In summary, homes and businesses with even street addresses may use sprinkler systems on even days; odd addresses on odd days; and watering may only take place from 6 a.m. to 9 a.m. and/or 6 p.m. to 9 p.m. This allows for 18 to 24 hours a week of sprinkler usage, giving property owners flexibility in providing turf grass with the one or two hours of watering necessary per week. This standard would be in place year round. The ordinance also would include two tiers of emergency provisions to respond to varying levels of drought with further restrictions on watering.
- Educational actions (e.g. bill inserts, web postings, newsletter articles, etc.) and enforcement actions (e.g. fines, citations) be reported through the LMO-2 or any new reporting method.
- Details on adopted ordinances, as well as tips on sustainable lawn care, be reported on municipal websites and printed materials.
- Allow for the use of non-potable water for outdoor uses in accordance with the Illinois Plumbing Code update.

Once a common ordinance is in place, IDNR should work with permitted communities, CMAP, IISG, NWPA and other relevant partners to develop a public education campaign. For communities looking to go further, IDNR should recommend the CMAP model ordinance (which includes many conservation practices in addition to sprinkler system usage).

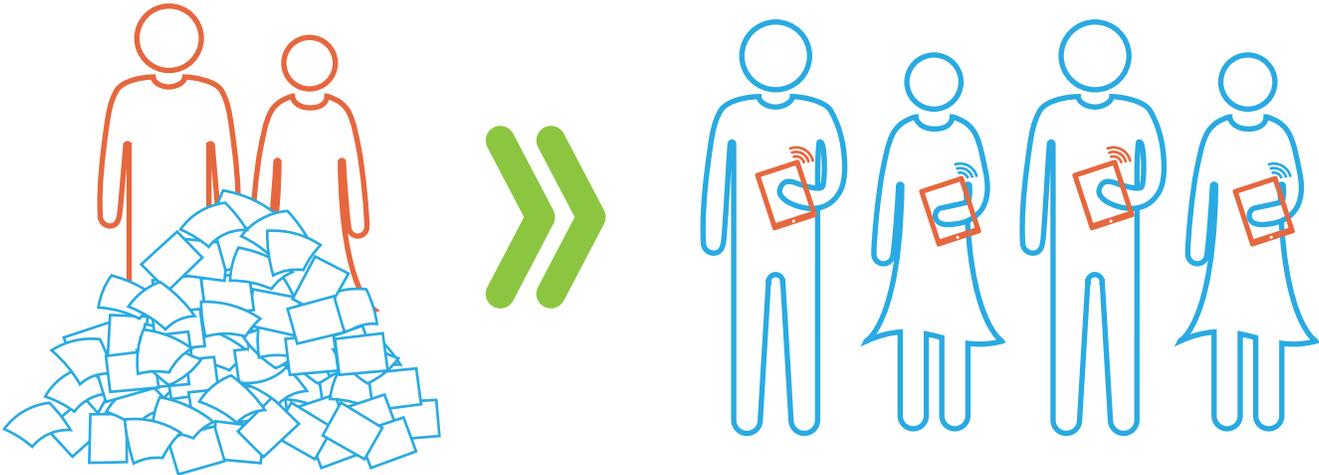
Fig 10. Inconsistent outdoor watering allowances among regional municipalities





SOLUTION #5

Increase the capacity of IDNR's Office of Water Resources to provide greater support to permittees



What's the problem? IDNR's current staff capacity is insufficient to build more proactive and collaborative relationships with its permittees, or to ensure productive and cost-effective management of Lake Michigan water.

What's the solution? IDNR needs to build the capacity of its Lake Michigan management program to analyze incoming data, check for possible inaccuracies, work with permittees on controlling water loss, and use every feasible means to manage Illinois' Lake Michigan diversion as efficiently as possible.

What it will achieve? An emboldened IDNR will be able to provide educational resources, technical assistance, data monitoring and other support to permittees, all in the service of improved management.

The general consensus from MPC's conversations with permittees was that they do not feel they receive the practical help they need from IDNR. The current capacity of IDNR's Lake Michigan Programs Section—as of the writing of this paper, there were two people on that team—is such that it can provide only minimal guidance on how to complete the LMO-2, or support on current best practices in water loss control, metering activities, plumbing innovations, educational programming, or automatic lawn sprinkler systems and other outdoor water usage controls. Many permittees would welcome a more pro-active and collaborative IDNR, in particular citing the regular dialogue facilitated by the Lake County Stormwater Management Commission as an example.

Staying on top of leading practices in water resources management is particularly challenging for small utilities with minimal staff capacity and small public works departments that manage roads, streetlights and sewers as well as a water utility. They simply have less ability to track advances in water loss controls or plumbing technology than larger peers, and often lack the time or expertise to develop or adopt educational materials for their customers. With greater resources, IDNR could help fill this knowledge gap by conducting regular workshops, disseminating information on leading practices and providing technical assistance to member communities.

At present, IDNR's Lake Michigan Programs Section has two program staff, and they have many responsibilities beyond permit compliance and day-to-day management at the permittee level. MPC recommends an explicit commitment by IDNR to energetic outreach and proactive management of permittees, as well as partnerships with professional organizations or other units of government to control water loss. Workshops, newsletters, training materials and regular one-on-one contact with permittees are needed, which will require additional IDNR staff dedicated solely to the tasks. That will require revenue. Adding two or three full-time employees—to double current staff capacity—with a mix of engineering, accounting and communications knowledge and experience would allow IDNR to provide a range of direct services to permitted communities and their residents. In addition to allowing IDNR to fulfill its duty to manage Lake

Michigan water, the value of adding this expertise—including the money and water it might save utilities—will be well worth the cost.

In return for such added services, a fee from permittees is a reasonable expectation; shared by all 200-plus permittees, this fee would not be onerous. To create a tangible incentive for improved management, the fee should be tied, in part, to each permittee's total pumpage and water loss. In the system outlined on the next page, the City of Chicago would pay the largest amount, but still less than \$4,000 a year. Based on 2010 data for 202 permittees using Lake Michigan water, the proposed fee structure would have generated approximately \$500,000.

However, for MPC to advocate for a fee of this nature, let alone for it to be accepted by permittee water utilities, it must lead to considerable enhancements in the services provided by IDNR's Office of Water Resources Lake Michigan Programs Section. The fee system proposed above would generate sufficient revenue for additional IDNR staff to expand and improve services—more accurate and timely data analysis, technical assistance to communities in need, quarterly workshops on pertinent topics and more.

Absent new revenues and capacity additions, IDNR can still undertake the following changes almost immediately:

- Request that permittees begin submitting the results of an annually filed AWWA M36 water audit in addition to the LMO-2, then track results over a three-year period. During that period, determine how LMO-2 and M36 results differ, and which gives a more accurate picture of water management regionally and at the community level. Post this water usage and loss data online annually in a readily accessible database (regardless of whether the data come from the LMO-2, M36 or some other accounting methodology), with a comprehensive trend analysis and benchmarking of comparable communities. IDNR also should issue and distribute a summary report.

Proposed source for revenue to increase IDNR's capacity

Part 1

Base data processing fee of \$1,000 (paid by all 202 permittees): \$202,000

Part 2

Net pumpage (in millions of gallons a day): \$89,750

- Less than 1 MGD: \$500 fee (76 permittees, subtotal of \$38,000)
- 1 to 3.9 MGD: \$750 fee (96 permittees, subtotal of \$72,000)
- 4 to 20 MGD: \$1000 fee (29 permittees, subtotal of \$29,000)
- More than 20 MGD: \$1250 fee (1 permittee, subtotal of \$1250)

Part 3

Net loss* as percentage of net pumpage (\$250 base, additional \$100 for each percentage point above 8%): \$148,250

*At present net loss would equal MUL + UFF. Assuming MUL is eliminated, the new tally of UFF would be used alone.

Part 4

\$1,000 fee for having an average of more than 1 million gallons of unmetered use per day (at present, only one permittee, Chicago, would be subject to this): \$1,000

Total \$441,100

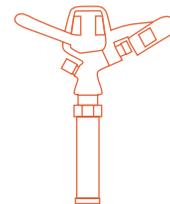
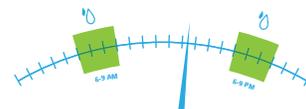
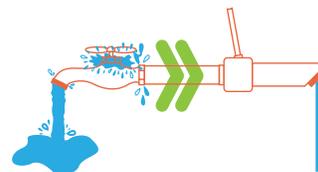
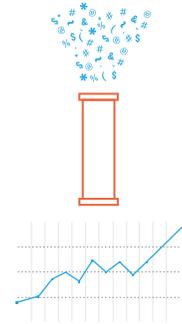
- Through a revised LMO-2 (or a new form entirely), begin collecting information on permittees' water system's capital investments, repair projects, rate-to-cost ratios and enforcement actions related to outdoor water use ordinances. Post this data (and a comprehensive trends analysis) online annually in a readily accessible database. IDNR also should compile and distribute a summary report.
 - Issue annual awards to permittees that excel in areas such as data collection and reporting, meeting permit condition requirements, reinvesting in capital infrastructure or enforcing local water use ordinances.
 - IDNR staff should work with the IEPA to modify the project selection criteria of the state revolving funds and the new Clean Water Initiative to prioritize projects meant to help permittees comply with Lake Michigan allocation permits. These funds provide low-interest loans for capital improvements; and having better data to inform priorities will increase confidence about return on investment. The knowledge that loan assistance might be available to help control water loss also might prompt some permittees to fast-track repair projects that otherwise might have been delayed or canceled, such as main repairs and replacements, upgrades in metering technology and purchases of variable speed pumps. With better data to perform proactive asset management, utilities will be better poised to take advantage of these funding opportunities as they arise.
- With additional revenue and staff capacity, IDNR could better serve the Lake Michigan service area by:
- Providing templates for water loss control plans, outdoor water use restrictions, local plumbing codes, educational materials and other materials related to permit compliance.
 - Conducting regular workshops for permittee staff—ideally on a quarterly basis—on a range of water resource management issues. Attendance at these workshops will ensure that all permittees receive the same information in a timely manner, and provide IDNR regular opportunities for face-to-face contact with utility operators. Such sessions also would allow for more in-depth policy discussion and coordination.
 - Providing more intensive assistance to a handful of priority communities each year to address all aspects of consumption and loss. These priority communities could include those struggling to manage water loss, modernize infrastructure, control costs, improve efficiency or other issues. CMAP's Local Technical Assistance program may serve as a good model or the best vehicle for this assistance. The Regional Transportation Authority has similar programs also worth investigating.
 - At the end of the three-year test period, convening a working group to determine if and how the M36 could be used in a regulatory setting (in place of or in addition to the LMO-2), what the benefits would be and how to best formally transition to the M36, if so desired.

CONCLUSION

The innovative yet pragmatic policy modernizations recommended here will help the Ill. Dept. of Natural Resources (IDNR) assist permitted users of Lake Michigan water to manage this immensely strategic resource more efficiently and cost-effectively, while also fulfilling legal responsibilities. These proposals, if enacted, will ensure that the state’s regulatory structure for Lake Michigan water promotes accurate data collection and analysis that can inform sound infrastructure investment. This, in turn, will reduce loss, mitigate the impact of rising energy and other treatment costs, identify Illinois communities most in need of targeted assistance to improve their utility performance, and position the region to guarantee reliable and efficient use of our water supplies.

If enacted, these reforms also will go a long way toward achieving the less resource-intensive vision articulated in CMAP’s *Water 2050: Northeastern Illinois Water Supply/Demand Plan*. IDNR has an undeniable responsibility to take all feasible measures to manage our unique diversion of Lake Michigan water according to modern, credible best management practices for water resources. The Lake Michigan permitting system is a powerful tool for promoting efficient water management, while not overly burdening permittees or dictating the details of water control that should be fine-tuned for local conditions. In the decades since the current permit conditions were conceived, accounting methodologies, water loss remediation strategies, plumbing standards, means of reducing loss from discretionary outdoor uses and other facets of sensible water resources have evolved considerably—making the existing permit conditions a vestige of a bygone era.

Modernization of the permitting process is overdue and would be of tremendous help to Illinois’ natural environment, economy, local water resource managers and residents. A final recommendation of this report is that IDNR should to continue to examine and evolve its policies and practices, including its permit conditions, as water technology and society change. The most effective regulations are those explicitly designed to keep pace with such evolution. 💧



APPENDIX A

Existing LMO-2 permit form

2012 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 1, 2011 through September 30, 2012. This form must be submitted to the Department by January 7, 2013.

Section I - General Information

Name, address and phone number of Permittee:

County: _____

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

e-mail address _____

Authorized Official _____

Title: _____

Date: _____

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

Population: _____ Number of existing households: _____

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 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 three decimal places. Conversion calculations are provided for your use in Section IV.

A. Pumpage Data

Water bought or received from the following distribution systems:

1. Lake Michigan Pumpage	_____	mgd
2. Shallow Aquifer Pumpage	_____	mgd
3. Deep Aquifer Pumpage	_____	mgd
4. Total Pumpage (add lines 1, 2 & 3)	_____	mgd
5. Water Treatment Use	_____	mgd
6. Gross Annual Pumpage (subtract line 5 from line 4)	_____	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	_____	mgd
8	_____	mgd
9	_____	mgd
10	_____	mgd
11	_____	mgd
12	_____	mgd
13. Total (add lines 7-12 and any additional amounts)	_____	mgd
14. Net Annual Pumpage (subtract line 13 from line 6)	_____	mgd

B. Uses	Metered	Unmetered	Total
15. Residential	_____	_____	mgd
16. Commercial and Manufacturing	_____	_____	mgd
17. Municipal	_____	_____	mgd
18. Construction	_____	_____	mgd
19. Total Uses (add Total lines 15 through 18)	_____	_____	mgd
20. Percentage of Total Use to Net Annual Pumpage (divide line 19 by line 14 and multiply by 100)	_____		%

C. Hydrant Uses

21. Firefighting and Training	_____	mgd
22. Water Main Flushing	_____	mgd
23. Sewer Cleaning	_____	mgd
24. Street Cleaning	_____	mgd
25. Construction	_____	mgd
26. Other (attach explanation)	_____	mgd
27. Total Hydrant Use (add lines 21 through 26)	_____	mgd

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)	_____ %
29. Department allowed maximum for Hydrant Use	_____ 1.0 %
30. Excessive hydrant use (subtract line 29 from line 28). If the percentage is greater than 0.0, attach an explanation. [see Rule 730.307 (e)]	_____ %
D. Unavoidable Leakage and Unaccounted for Flow	
31. Maximum Unavoidable Leakage (Do worksheet in Section III; enter amount from line 10 of the worksheet)	_____ mgd
32. Percentage of Maximum Unavoidable Leakage to Net Annual Pumpage (divide line 31 by line 14 and multiply by 100)	_____ %
33. Total Accounted for Flow (add lines 19, 27 and 31)	_____ mgd
34. Percentage of Total Accounted for Flow to Net Annual Pumpage (divide line 33 by line 14 and multiply by 100)	_____ %
35. Total Unaccounted for Flow (subtract amount on line 33 from line 14)	_____ mgd
36. Percentage of Total Unaccounted for Flow to Net Annual Pumpage (divide line 35 by line 14 and multiply by 100)	_____ %

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 calculations.

Section III - Maximum Unavoidable Leakage Worksheet

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

A. Cast Iron Pipes With Lead Joints

Age of Pipes	Miles of Pipe	Leakage Rate	Maximum Unavoidable Leakage
1. 60 yrs. or greater		x 3,000 g/d/mi =	_____ g/d
2. 40-60 yrs.		x 2,500 g/d/mi =	_____ g/d
3. 20-40 yrs.		x 2,000 g/d/mi =	_____ g/d
4. 20 yrs. or less		x 1,500 g/d/mi =	_____ g/d

B. All Other Types of Pipes and Joints

Age of Pipes	Miles of Pipe	Leakage Rate	Maximum Unavoidable Leakage
5. 60 yrs. or greater		x 2,500 g/d/mi =	_____ g/d
6. 40-60 yrs.		x 2,000 g/d/mi =	_____ g/d
7. 20-40 yrs.		x 1,500 g/d/mi =	_____ g/d
8. 20 yrs. or less		x 1,000 g/d/mi =	_____ g/d
9. Total Miles	_____	Total Leakage	_____ g/d
10. Total Maximum Unavoidable Leakage, in mgd (divide total leakage on line 9 by 1,000,000) (Enter this amount on line 31 of "Section II - Water Use Audit)			_____ mgd

APPENDIX B

Summary of IDNR's proposed Lake Michigan water allocation rule changes

As of Jan. 7, 2013. The following is a brief summary of IDNR's substantive proposed changes to its Part 3730—Rules for the Allocation of Water from Lake Michigan. MPC's further recommended changes are found in Appendix C.

Part 3730.101—Scope and Purpose

A purpose section has been added to clearly state that it is the intention of the Department's program for the allocation of water from Lake Michigan to comply with the provisions of the U.S. Supreme Court Decree governing Illinois' allowable diversion. More specifically, Illinois' total diversion is not to exceed a 40 year running average of 3,200 cubic feet per second (2.1 billion gallons per day).

Part 3730.102—Definitions

The definition of unavoidable leakage and the methodology for determining unavoidable leakage has been eliminated. The definition of unaccounted-for-flow has also been revised so that it no longer includes any mention of unavoidable leakage. With this change, water loss that used to be excused as unavoidable leakage will now be included as part of a water system's unaccounted-for-flow.

Part 3730.206—Notice of Hearing

Kendall County has been added to the list of counties to receive notification of upcoming hearings, and the Chicago Metropolitan Agency for Planning replaces the Northeastern Illinois Planning Commission.

Part 3730.301—Allocation Permits

Subpart b) Language has been added to clarify that the Department will no longer issue an allocation for Lake Michigan water diverted to operate the two lakefront locks (lockage), or for Lake Michigan water that may leak through lakefront structures that separate the Chicago Waterway System from Lake Michigan (leakage). The Department will hold an amount of Lake Michigan water in reserve for these two categories of direct diversion. This change reflects the current practice of the Department to no longer hold the Water Reclamation District of Greater Chicago responsible for lockages or leakage since they do not operate the lakefront locks nor are they responsible for all structures that separate the lake from the river system.

Subpart c and d) Language has been revised to give the Department discretion in deciding whether to issue a notice of violation of an allocation permit. Current language says the Department "shall" issue a notice of violation, and the proposed language states that the Department "may" issue a notice of violation.

Part 3730.302—Application

A new subpart (g) has been added to include a description of an applicant's existing and proposed water conservation program. In actual practice the Department has been asking for this information for many years.

Part 3730.303—Classification of Water Users

This section and subparts have been revised so that the second category of domestic use (applicants whose use of Lake Michigan water will reduce regional use of the deep aquifer) becomes a higher priority than the use of Lake Michigan water for navigation requirements in the Sanitary and Ship

Canal and for minimum discretionary diversion flows to keep the canal in a 'reasonable satisfactory sanitary condition'.

One category is proposed for elimination (applicants whose water demands are for the minimum discretionary diversion flows necessary to meet water quality standards in the Sanitary and Ship Canal). The Department has never granted an allocation for this purpose, and believes that the category covering discretionary diversion flow to keep the canal in a 'reasonable satisfactory sanitary condition' is sufficient.

The upper limit for discretionary diversion is lowered from 320 cubic feet per second to 270 cubic feet per second

Finally, language has been added to clarify that Category III applicants do not qualify to receive a Lake Michigan water allocation. This has been the Department's practice, and will now be stated clearly in the Rules.

Section 3730.304—Water Needs Criteria

Subpart a) Adds to the list of water conservation practices to include an outside water use control/lawn sprinkling ordinance. New language added to require applicants that exceed 8% Unaccounted for Flow to submit a compliance plan with time frame outlining the actions that will be taken to come into compliance. Also directs the Department to consider this information in determining proper allocation amounts.

Section 3730.307—Conservation Practices and Other Permit Conditions

Subpart b) Keeps the unaccounted-for-flow standard at 8% of net annual pumpage, even though the allowance for unavoidable leakage has been eliminated; requires permittees to submit a compliance plan to return to the 8% standard if any two consecutive accounting periods show an unaccounted-for-flow greater than 8%. Adds a sentence that directs the Department to recognize that compliance with the 8% standard can require significant capital expenditures and a lengthy time frame, which will be taken into consideration in approving compliance plans.

Subpart c)2) Adds a requirement for sub-metering in all multi-family buildings in new construction.

Subpart c)4) Updates the requirement to install water efficient plumbing fixtures in new and replacement plumbing fixtures such that they will be a labeled Water Sense product.

Subpart c)8) Modifies the lawn sprinkling requirement to add a time of day restriction (lawn sprinkling will not be allowed between 10am-4pm nor on consecutive days), and requires new/replacement sprinklers to have a Water Sense labeled irrigation controller.

Subpart f) Adds a recommendation that water rates reflect the full cost of water service, which includes the long term cost to properly maintain and operate the water supply distribution system to keep system losses to a minimum.

APPENDIX C

MPC's recommended changes to IDNR's proposed Lake Michigan water allocation rule changes (Title 17, Part 3730)

The following is an excerpt from MPC's comment letter to IDNR, which supports their proposed rule changes, as well as recommends further reforms. For more details and the precise wording of the standards, please refer to <http://www.dnr.illinois.gov/WaterResources>.

SUBPART A: GENERAL RULES

3730.102 Scope and Purpose

MPC supports the clarification of IDNR's purpose for the Lake Michigan program.

3730.102 Definitions

Unavoidable leakage

MPC supports IDNR moving ahead in the near-term to eliminate the exemption for Maximum Unavoidable Leakage (MUL), while laying the groundwork to address the remaining challenges. Over the next three years, IDNR and its permittees should begin to explore the possible benefits of a more comprehensive utility performance assessment process, such as the American Water Works Association's M36 water audit method. In the short-term, this could include using the LMO-2 to gather a broader array of information on utility performance (see Reporting Requirements below). In order to have sufficient time to process and interpret these new data, and to better assure accurate reporting, IDNR should also establish a compliance amnesty for the first three years following MUL's elimination. Assuming these rules are adopted in 2013, this amnesty period would mean that the 8 percent Unaccounted for Flow compliance clock would not start ticking until 2016. This will encourage permittees to embrace this change, and also give IDNR sufficient time to gauge measures of usage and loss more accurately. It may also allow time for assessing the viability of the AWWA M36 auditing methodology, or some other alternative.

The elimination of MUL will improve the quality of information IDNR and permittees have to make decisions about how best to manage our Lake Michigan water.

Furthermore, MPC strongly recommends a change in terminology from UFF to the term "non-revenue water." This terminology is the more commonly used phrase in the industry and more accurately reflects the loss of value of the treated water.

SUBPART B: HEARING

3730.206 Notice of Hearing

MPC supports the updating of hearing notification by correcting the Chicago Metropolitan Agency for Planning's name and adding Kendall County. Keeping Kendall County updated fits within the goal of reducing regional dependence on the deep aquifer system.

SUBPART C: ALLOCATION RULES

3730.301 Allocation Permits

b) Issuance of allocation permits

MPC supports the clarification on holding reserves for leakage and lockage.

c) & d) Violations of permit

MPC acknowledges that the change from "shall" to "may" serves as a good faith effort on the part of IDNR to show permittees that it will provide flexibility and effort on an individual basis with communities to work through the transition of eliminating MUL. MPC believes IDNR should ensure that the discretion implied by the change to "may" be applied fairly and consistently with permittees and that permittees be held accountable for violations of permit conditions after inaction for a set period of time. A more formal declaration of an initial amnesty period—we recommend at least three years—as well as regular and direct communications and training opportunities between IDNR and permittees would go a long way to gaining the support and cooperation of permittee utilities.

3730.302 Application

MPC supports the codification of requiring applicants to provide existing and proposed water conservation programs. We would go further to suggest that applicant communities be required to implement and document their water conservation programs for at least three years before applying for a Lake Michigan allocation.

3730.303 Classification of Water Users

MPC supports the prioritization of applicants whose use of Lake Michigan water would reduce regional use of the deep aquifer over the discretionary diversion for navigation. MPC also supports the elimination of the category for discretionary diversion for the purposes of meeting water quality standards. We agree with IDNR that the intent is covered under the category of diversion to keep the canal in a "reasonable satisfactory sanitary condition."

3730.304 Water Needs Criteria

a) Permit pre-conditions

MPC supports the proposed changes, but suggests IDNR go a step further. Currently, allocation applicants do not need to comply with the Lake Michigan service area water conservation requirements until they are granted a permit. Not implementing water conservation prior to applying for a permit results in application requests for unrealistic and excessive water quantities. Additionally, communities may find that through demand management, conservation and efficiency, their existing water supplies will be sufficient, and any allocation of Lake Michigan water may be unnecessary.

As an application pre-condition, we recommend that Illinois require applicants for new allocations to demonstrate implementation of a multi-year (at least three-year) demand management and conservation program, consistent with, or more progressive than, what is required by IDNR of existing permittees, to extend the life of the applicant's current water source.

3730.307 Conservation Practices and Other Permit Conditions

b) Non-compliance

MPC supports changes to the requirements for a compliance plan in cases of non-compliance. Requiring submittal of a compliance plan after two consec-

utive years of non-compliance, rather than immediately fining for non-compliance, shows that IDNR understands the significant capital investment requirements permittees need to come into compliance, particularly with the elimination of the maximum unavoidable leakage exemption. We recommend that IDNR provide guidance to permittees as to what compliance plans should contain and approximate time for compliance or benchmarks for incremental reductions of Unaccounted for Flow. IDNR should make it clear to permittees that it is not their desire to punish non-compliant permittees, but to give them flexibility to come out of compliance as soon as feasibly possible through incremental improvements.

c) Conservation practices

Overall, MPC supports proposed changes to subpart c) and recommends that IDNR provide appropriate models for the listed conservation practices, put these models online and provide periodic training or presentations on these models.

c) 2) Metering for new construction and existing non-metered buildings

While MPC supports in concept IDNR's proposed change requiring sub-metering for new multifamily buildings, we believe that there are more pressing and cost-effective metering issues to address first. IDNR's existing permit conditions require installation of meters on new and rehabilitated buildings, which does little to prompt permittees with an existing metering gap to address it. This should be the immediate priority. IDNR should require that within two years permittees without universal metering develop a plan for covering that gap within 10 years. Furthermore, IDNR should work with CMAP to compare information to determine how wide the region's metering gap truly is, and provide targeted assistance to permittees struggling to either plan for or implement universal metering. The City of Chicago's metering gap is well known, but LMO-2 data and a survey of communities throughout northeastern Illinois conducted by CMAP in 2008 do not tell the same story about the region's metering gap – many more Lake Michigan communities reported a metering gap in CMAP's survey than on the LMO-2. This needs to be resolved, and IDNR's metering focus for the immediate future should be to ensure that every existing and new building in the Lake Michigan service area has a functioning, accurate meter.

While the proposed requirement for sub-metering is a good policy and can promote more efficient usage by individual users, it should not be a requirement at this time. In general, residents of multifamily buildings have consistent and relatively low water usage trends with little in the way of outdoor water uses that lead to summertime spikes. Metering these users individually reminds them of their role in shared water resources challenges, but may not improve water resources management in proportion to the cost of implementation. IDNR should recommend sub-metering, without requiring it (similarly, IDNR should recommend, but not require, the use of advanced, remote read meters). IDNR should focus its efforts where they have the most cost-effective impact, and in the area of metering, that means resolving the existing metering gap.

c) 4) Water efficient plumbing fixtures

MPC fully supports the update to require water efficient plumbing fixtures for new and replacement fixtures in line with the WaterSense label standards. Further, IDNR should recommend permittees adopt modern plumbing codes, such as the forthcoming Illinois Plumbing Code "green supplement," and recommend permittees review and revise those codes every three years. IDNR should coordinate with the Ill. Environmental Protection Agency and Ill. Dept. of Public Health to develop a statewide non-potable water reuse policy that protects public health and water quality while putting available water resources to more productive use.

c) 5) Closed system air conditioning

MPC recommends that IDNR modify permitting requirements to be consistent with the section on Cooling Systems in the CMAP *Model Water Use Conservation Ordinance*.

c) 6) Faucets in lavatories for public use

See "Water efficient plumbing fixtures," above.

c) 7) Car wash installations

IMPC recommends that IDNR modify permitting requirements to be consistent with the section on Water Recycling Systems in Commercial Facilities in the CMAP *Model Water Use Conservation Ordinance*.

c) 8) Non-essential outside water use

MPC supports the update to the required land sprinkling ordinance to add time-of-day and day-of-week restrictions, and to require new/replacement sprinklers to have a WaterSense-labeled irrigation controller. Further, IDNR should look to the Northwest Water Planning Alliance and/or CMAP's *Model Water Use Conservation Ordinance* as regional models for progressive action on discretionary outdoor water use. These changes will help reduce permittees' peak demand for water, which in turn will alleviate the consequences of droughts, reduce the need for communities to make capital expansions to their water systems and possibly even allow communities to reduce their requested allocations of Lake Michigan water, freeing up water for other users – and regional growth.

f) Water rate structures

MPC supports IDNR's recommendation that water rates reflect the full cost of water service, including long-term costs to properly maintain and operate water systems. Water utilities – both public and investor-owned – should adopt full-cost pricing in order to generate sufficient revenues for high-quality water management now and in the future. In the near-term, IDNR should initially recommend use of full-cost pricing and provide guidance to permittees on a standardized accounting methodology and subsequent rate setting. IDNR should require that permittees begin incremental steps toward full adoption of full-cost pricing within the next 10 years. IDNR should establish a standardized accounting process to understand those revenue needs. As mentioned above, in order to ensure accurate accounting, IDNR and permittees should move toward comprehensive, advanced metering, and IDNR should require meter installation on all new and existing structures. By making these changes, water resource managers will generate sufficient revenue from system users to operate, maintain and invest in high-quality water systems.

ADDITIONAL

3730.109 Public information

MPC recommends that IDNR conduct quarterly workshops for public works officials in permittee communities, requiring attendance by one municipal staff member and one elected official from each permittee community. These workshops will allow for IDNR staff, outside experts and current/prospective permittees to exchange ideas and build a common base of knowledge consistent with the recommendations from the *Water 2050* report. IDNR should display all publicly available data, including all data from LMO-2 submissions, online in a timely manner.

3730.309 Reporting Requirements

MPC recommends that LMO-2 form logistics should be modified to adjust the accounting year to match the calendar year and update the LMO-2 form so that it can be completed electronically.

Additionally, while the elimination of MUL is a necessary first step, MPC believes IDNR should take this opportunity to begin to build a more comprehensive understanding of water resources management and utility performance in the Lake Michigan service area. MPC recommends that the LMO-2 form contents should be expanded to include at least the items below. It is our belief that IDNR's current authority allows it to request such information as it may wish to put on its LMO-2 form, and that accordingly, permittees would have to submit that information:

- Water rates – residential per 1,000 gallons, commercial per 1,000 gallons, industrial per 1,000 gallons, irrigation rate per 1,000 gallons, billing frequency, description of rate structure, ratio of annual and monthly revenue to system costs.
- Summary description of budgeting, costs and rate-setting, as well as planned capital investments.
- Results of M36 auditing process, including but not limited to data validity scores, Infrastructure Leakage Index, and measurement of non-revenue water.
- Record of enforcement actions related to water conservation ordinances.
- Record of public education efforts, including quantitative totals of outreach.
- Miles of pipe replaced, miles of pipe repaired, number of yearly replace/repair projects.
- Main breaks.
- Descriptive narratives to explain significant changes from year to year, including but not limited to large fluctuations in total water use and UFF,

- rate changes, changes in number of main breaks, changes in M36 audit index or validity scores, etc.
- Reconcile items listed as “required” in the rules, but not currently found on the LMO-2 form:
 - Individual well production rates, including well numbers, average pumping wells, average number of hours pumped per day;
 - For each well, provide a list of all parameters that exceed the standards in 35 Ill. Adm. Code 601-607;
 - A list of wells, if any, that interfere with each other during simultaneous pumping;
 - Description of problems anticipated from any well supply;
 - Copy of the current water rates for all consumers, including rate structure, as well as a summary page from the annual budget to show balances in water-related funds and anticipated costs and revenues

APPENDIX D

Lawn watering policies in northeastern Illinois

Throughout northeastern Illinois, outdoor water use ordinances often regulate the type of equipment used to water lawns, allowable hours and days for watering, and the distribution of permits for watering. Outdoor water ordinances also may address the type of vegetation that may be legally watered, size and location of turf, soil depth, mulching, planting, and watering related to the establishment of new sod. Ordinances can be geared toward residential property owners, construction companies that do landscaping, homeowners associations, or commercial/industrial/institutional users. For the latter group, ordinances could require a formal, written water use plan to be created, as well as water budgets, which include a maximum annual water allotment; and reporting requirements for descriptions of water efficiency technologies the customer will deploy, irrigation schedules and water budgets.

There are a few general types of lawn watering ordinances found in the northeastern Illinois communities that have such regulations. The various types of ordinances include:

Time-of-day provision: Outside water use is allowed only for a few hours in the morning and in the evening. This reduces water use during the hottest part of the day, when water most likely would be lost to “evapotranspiration” (i.e., to the atmosphere) rather than being absorbed by the grass and soil. Also, restricting the amount of time allowed for watering can allow time for municipal water storage tanks to recharge in the morning and evening.

Hours per day or days of the week provisions: With these types of provisions, communities can mandate that their residents only water their lawns for a certain number of hours per day. Alternatively, communities may only permit lawn watering on certain days of the week.

Even-odd calendar day restriction: This restriction allows properties with even-numbered street addresses to water their lawns on even calendar days, while odd-numbered properties can water their lawns on odd calendar days.

Even-odd days of the week restriction: This is similar to the previous restriction; however, rather than restricting outdoor water use by calendar days, it restricts use to certain days of the week. For instance, watering of even-numbered properties could be permitted only on Wednesday and Saturday, while odd-numbered properties would be watered only on Thursday and Sunday.

Status-based restrictions: “Status-based” means that the level of watering restrictions is adjusted for the severity of weather conditions, especially drought. This type of ordinance is more flexible for responding to changing

weather conditions and drought. It incorporates other types of restrictions into a set of tiers. There can be any number of tiers, though in this region, there tend to be three or four, and the tiers are often color-coded, for easy understanding. Generally the most restrictive tier, or “red,” includes a total ban on outdoor watering. Thresholds for the least restrictive, “green,” and the middle ground, “yellow,” vary in each community.

Emergency restrictions: Many communities have water emergency proclamation provisions, which are put into effect when the mayor or village manager declares a water emergency. These restrictions can range from time-of-day restrictions to full bans on outdoor water use, depending on the scope of the emergency they are meant to address, but are only activated if an emergency is declared. Communities may have emergency restrictions on top of other day-to-day restrictions, or they may not have any other lawn watering restrictions, save for the emergency provision.

How NWPA coordinates lawn watering ordinances

The 80 communities (of DeKalb, Kane, Kendall, Lake and McHenry counties) of the Northwest Water Planning Alliance (NWPA) chose to adopt a shared lawn watering ordinance among its member communities to improve uniformity of regulations between the various communities in order to maintain their shared water source fairly, as well as for ease of education and outreach to local property owners. Many of the individual communities that chose to vote for the self-imposed regulations did so to manage their regional water supply in a fiscally responsible way (for reasons noted earlier (especially to avoid capital improvements, like expanding their system capacity to accommodate spikes of water use).

The ordinance is structured as a three-tier, color-coded system that allows for flexibility to respond to changing weather conditions, is easy to monitor and enforce, and is conducive to education and outreach campaigns.

- **Green (in place year-round):** Properties with even-numbered street addresses may water lawns using sprinkler systems on even calendar days, while odd addresses may water on odd days. Watering with sprinklers is permitted between 6 to 9 a.m. and 6 to 9 p.m. This allows for up to 18 or 24 hours (depending on how many even or odd days) available for sprinkler use each week, while northeastern Illinois lawns generally need fewer than two hours per week with modern sprinklers. Non-potable water and handheld watering devices (instead of a wasteful “scatter-spray” nozzle, as listed in the Yellow section) can be used any day or time.

- Benefits: Having this ordinance, which is based on the most conservation-oriented existing models in the region, in place year-round should create considerable water conservation improvements, particularly for the deep aquifer. This ordinance also benefits from being straightforward to enforce.
- **Yellow (during near-drought or moderate drought periods):** Outdoor use of water is allowed only for filling swimming pools less than 50 gallons; using drip-irrigation systems; using buckets, watering cans or handheld hoses with automatic shutoff devices for watering trees, shrubs and flowers; or with the use of reclaimed graywater, recycled effluent, or harvested rainwater. The use of sprinkler systems is prohibited.
- **Red (during extreme drought periods):** Total ban on outdoor watering.

For communities without the desire or resources to use the color-coded alert system, the recommendation is to adopt the “Green” restriction as a year-round ordinance with provisions to switch to the others through emergency proclamations without the use of a color-coded alert system.

Additional provisions to the ordinance include:

- The waste of water is prohibited. This includes: allowing sprinkler systems to run water onto impervious surfaces, such as sidewalks and driveways; the spraying of impervious surfaces; car washing with potable water other than with a handheld hose with an automatic shutoff valve or a bucket; and, other extraneous outdoor use of treated, potable water.
- There is a ban on sprinkler use on July 31st and August 31st due to the unequal number of odd versus even days in a calendar year (same restriction as Yellow).
- The installation of new sod or seed must happen according to the following:

- The laying of, planting or establishment of new sod or seed is prohibited for the months of July and August and during any Yellow or Red alert periods.
- During other times of the year, the watering of new sod or seed is permitted only:
 - * by following the current allowable lawn watering days and times,
 - * by using reclaimed graywater, recycled effluent or harvested rainwater, or
 - * by obtaining an extended watering permit that allows continuous irrigation with sprinklers for eight hours for the first day, and watering any day, but following time restrictions for the second through tenth days.
- Communities can at any time keep or initiate ordinance provisions that are more conservation-oriented.
- Communities can impose a total outdoor watering ban for water conservation, service interruption or emergency purposes at any time.
- Specific penalties can be set by individual communities. A fee that increases with the number of violations is recommended, and a portion of those fees should be set aside for water conservation education activities.

In this lawn watering ordinance system, the NWPAs role would be to recommend to member communities when the switches from Green to Yellow or Yellow to Red should occur, based on drought conditions or other information obtained from the Illinois State Water Survey, the U.S. Drought Monitor or other credible scientific sources; provide assistance with implementation; advise on enforcement methods; assist with monitoring results after the ordinance updates; recommend future adjustments based on new technology and research; and provide education and outreach materials for both communities and property owners.

APPENDIX E

Water loss control assistance by the American Water Works Association

Courtesy of John van Arsdel, American Water Works Association (AWWA).

In 1997, AWWA partnered with the International Water Association (IWA) to develop a best practice water audit method that features well-defined terminology and an array of objective performance indicators. AWWA’s Water Loss Control Committee adopted this methodology in 2003: *Applying Worldwide Best Management Practices in Water Loss Control*, Journal AWWA, August 2003 and subsequently completely revised the AWWA M36 publication, *Water Audits and Loss Control Programs* (3rd Ed, 2009) around this methodology.

The Water Loss Control Committee also created the AWWA Free Water Audit Software® in 2006, to which several upgrades have led to the current Version 4.2 (2010). The 3rd Ed M36 publication is one of the three top-selling manuals of 37 such publications in the AWWA “M” Series. The AWWA Free Water Audit Software has been downloaded thousands of times, throughout the United States and across the world. These tools present a robust, standardized water audit methodology to water utilities in a workable, user-friendly manner.

Because the AWWA Free Water Audit Software includes a unique data “grading” feature, each utility can be evaluated on its operational and financial performance, as well as the quality of its data. Hence, an assessment of the degree of refinement of the water audit can be determined, as well as a measure of the utility’s performance based upon the output parameters from the water audit. The collected results from the 21 water utilities are available for free download from the AWWA website, awwa.org, for use as a benchmark by other utilities.

Use of AWWA methods by regulatory agencies for data collection

A number—including the following—state, provincial and regional water regulatory agencies have adopted requirements for water utilities to annually report standardized water audit data using the methodology advocated by AWWA.

State of Georgia: Under the landmark Water Stewardship Act, water audit data from 2011 was being collected in 2012, using the AWWA Free Water Audit Software.

The State of Texas was the first state to require regular reporting of water audit data in the format recommended by AWWA. Initially required every five years, data was collected in 2005 and 2010; recently, annual water audits became mandatory for utilities seeking state funding.

The Delaware River Basin Commission (DRBC) has been a pioneer in advancing the use of best practice water audit methods. In 2009, DRBC revised its Water Code to require annual water audits from the 600-plus water utilities in the Delaware River Basin, starting with 2012 data to be reported in 2013. DRBC staff has been active in the AWWA’s Water Loss Control Committee, playing an instrumental role in the development of the AWWA Free Water Audit Software, which is the data collection tool in this effort.

The Pennsylvania Public Utility Commission undertook a two-year pilot program using the AWWA Free Water Audit Software in 2010 and 2011 and moved to make the submittal of annual water audits a permanent requirement from the privately held water utilities that it oversees.

Tennessee Office of the Comptroller: After adopting a new regulation in 2007 using the dated “unaccounted-for” water approach, AWWA’s Water Loss Control Committee was successful in moving the Comptroller’s Office to utilize the AWWA method and the AWWA Free Water Audit Software; a revised auditing requirement under this approach goes into effect in 2013.

A recent regional effort in Great Lakes states that is trying to combine water loss control with water sustainability is being organized by the Center for Neighborhood Technology (CNT). AWWA is a partner in this effort along with the Alliance for Water Efficiency (AWE). The first task of this initiative is the collection of survey data on practices for water loss reduction by the 10 largest water utilities in each of the eight Great Lakes states. Undertaken in the spring of 2012, the response rate was very high, with 55 of 80 systems solicited completing the survey. CNT will be working more closely with Great Lakes utilities and regulatory agencies to promote a standardized approach to water auditing and measurable reductions of excessive non-revenue water.

The use of this water audit format is spreading. Its results are becoming more evident to utilities. Rather than a perception of punitive measures based on Unaccounted for Flow, they are recognizing the water audit’s usefulness to demonstrate not only the need for corrective action, but also where that corrective action should take place. The individual audits have helped utilities develop water loss reduction strategies that are cost efficient and practical because the focus is now on water loss costs that directly affect the utility, not on water loss volumes that are artificially (and inaccurately) calculated. That cost driver can provide the incentive to utilities not only to use AWWA’s audit format, but to use it enthusiastically, as it identifies exact areas of water loss as related to costs. 💧



MPC PROJECT TEAM

Project Principal

Josh Ellis

Program Director

Mandy Burrell Booth

Communications Director

Abby Crisostomo

Program Associate

Ryan Griffin-Stegink

Communications Associate

Matt Harrison

Research Assistant

Shannon Madden

Research Assistant

Matt Nichols

Research Assistant

Ariel Ranieri

Communications Assistant

Kara Riggio

Program Associate

Peter Skosey

Executive Vice President

Kyle Terry

Research Assistant

Angie Ziech

Research Assistant

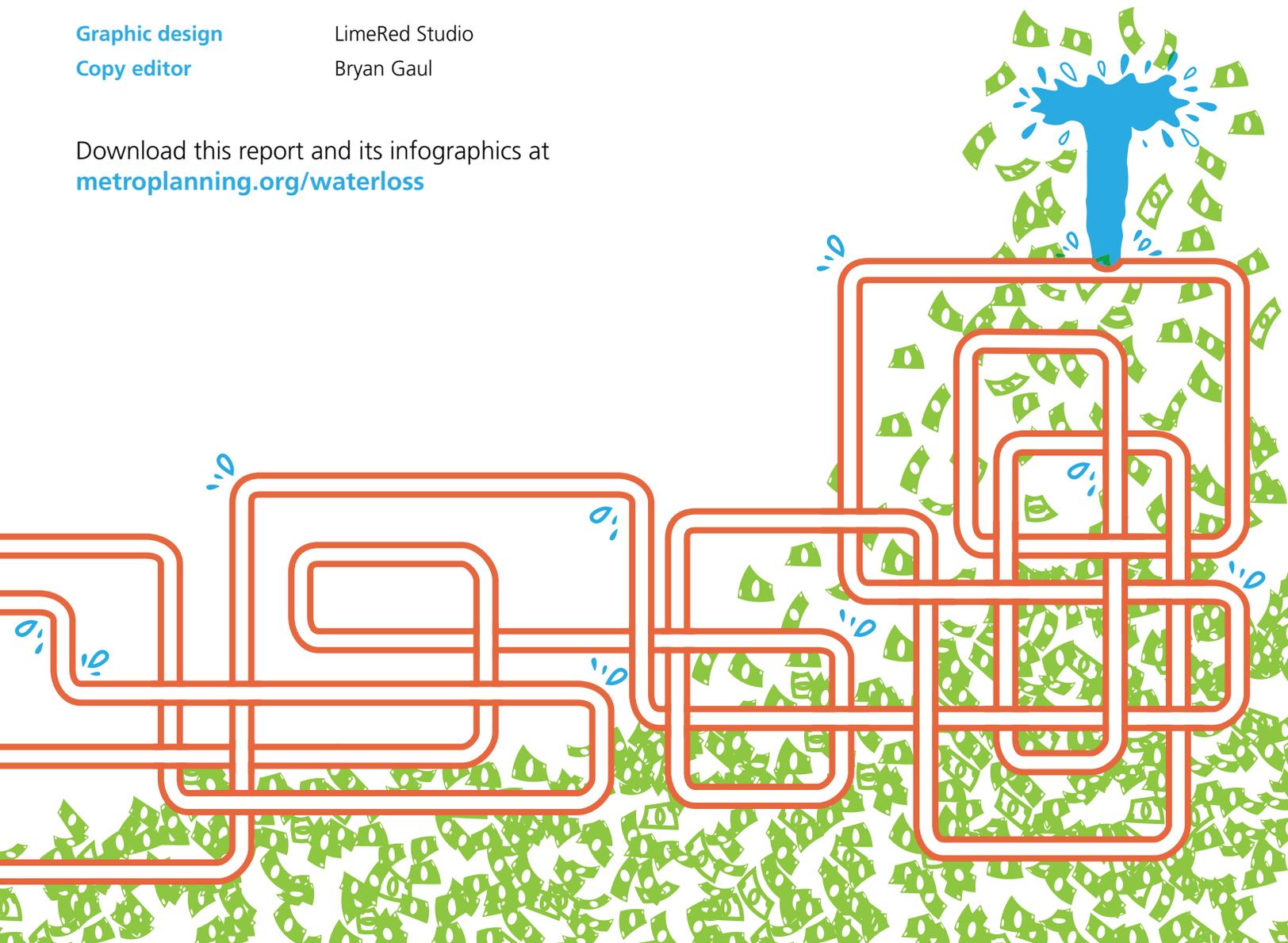
Graphic design

LimeRed Studio

Copy editor

Bryan Gaul

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Since 1934, the Metropolitan Planning Council (MPC) has been dedicated to shaping a more sustainable and prosperous greater Chicago region. As an independent, nonprofit, nonpartisan organization, MPC serves communities and residents by developing, promoting and implementing solutions for sound regional growth.



140 S. Dearborn St.
Suite 1400
Chicago, Ill. 60603

312.922.5616

metroplanning.org
twitter.com/metroplanners
facebook.com/metropolitanplanningcouncil