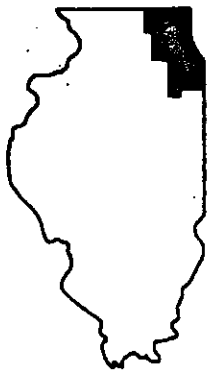
# Suggested Water Conservation Ordinance

# A Guide For Local Officials

ANOTHER IN THE SERIES OF PLANNING
AIDS FROM THE : NORTHEASTERN
ILLINOIS PLANNING COMMISSION

(MARCH, 1980)



**Northeastern Illinois** is a diverse in its land use and complex in its political structure. It has some of the most productive farms on earth - also one of the world's greatest cities. It contains 3,714 square miles of land and 38 square miles of water. It is home to 7 million people, organized in more than 1,250 units of government.

In 1957, following a decade of rapid urbanization in the Chicago suburban area, the Illinois General Assembly created the Northeastern Illinois Planning Commission (NIPC) to conduct comprehensive planning for the six-county greater Chicago region.

The Commission is expressly directed to meet the problems of metropolitan growth head on. It has three statutory charges: conduct research and collect data for planning; assist local government; and prepare comprehensive plans and policies to guide the development of the counties of Cook, DuPage, Kane, Lake, McHenry and Will.

By necessity, regional planning deals with general development policies not local land use detail. NIPC supports and coordinates county and municipal planning. The Commission has advisory powers only and relies upon voluntary compliance with its plans and policies.

# northeastern illinois planning commission

400 West Madison Street Chicago, Illinois 60606 (312) 454–0400

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# SUGGESTED WATER CONSERVATION ORDINANCE

This is another in a series of planning aids and manuals prepared by the Northeastern Illinois Planning Commission as a service to local governments under a section of its enabling act which authorizes the Commission to "prepare and make available to units of government standards for planning and regulatory ordinances, practices, and procedures". This ordinance has been prepared as a model to assist local units of government in developing their own regulations. Background information has been included to provide a perspective for the officials who may be called upon to interpret the basic requirements.

The preparation of this suggested ordinance and commentary was financed in part through funds from the U.S. Environmental Protection Agency under Section 208 of Public Law 92-500 (as amended). The contents do not necessarily reflect the position of the U.S. Environment Protection Agency.

March 1980

# northeastern illinois planning commission

400 West Madison Street Chicago, Illinois 60606 (312) 454-0400




March 31, 1980

To Public Officials and Citizens of Northeastern Illinois

I am pleased to transmit to you this "Suggested Water Conservation Ordinance."

The ordinance responds to the management agency acceptances signed in connection with the Areawide Water Quality Management Plan. That plan calls on all municipal and county governments in northeastern Illinois to utilize their local plumbing and building codes to conserve water resources and to reduce wastewater flows. This ordinance provides local units of government with a model which they can adopt or which they can use as a source of information in the development and/or revision of their local codes.

The preparation of this ordinance was based on Commission staff efforts as well as contributions by area counties and municipalities and the Water Resources Technical Advisory Committee. Overall guidance was provided by the Commission's Areawide Water Quality Steering Committee.

Sincerely,

Edgar Vanneman Jr.
President

EV:dlw
Attachment

# northeastern illinois planning commission

400 West Madison Street Chicago, Illinois 60606 (312) 454-0400




March 31, 1980

Mr. Edgar Vanneman Jr.
President
Northeastern Illinois Planning
Commission
400 West Madison Street
Chicago, Illinois 60606

Dear President Vanneman:

This will transmit to you the Suggested Water Conservation Ordinance recommended for consideration and adoption by local governments in northeastern Illinois.

Local enactment and administration of this ordinance will serve to conserve the region's water resources and to reduce wastewater flows. Provisions of the ordinance are consistent with both the Regional Water Supply Plan and the Areawide Water Quality Management Plan.

Sincerely,

Lawrence B Christmas

Lawrence B. Christmas
Executive Director

LBC:ss
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# BACKGROUND INFORMATION

## Section A: MUNICIPAL WATER CONSERVATION PROGRAMS

1.01 INTRODUCTION The Commission's 208 Areawide Water Quality Management Plan recommends that all municipalities and counties seek to achieve continued reductions in water use in order to conserve water resources and to reduce wastewater flows. The 208 Plan states that this should be accomplished through the modification of building codes to require water conserving plumbing fixtures, metering of all new developments, adoption of pricing policies, and the development of public education programs.

This document is intended to assist local governmental units in meeting the water conservation objectives of the 208 Plan. It is similar to others in the series of local planning aids prepared by this Commission in that it is presented as a model for the guidance of local governments in adopting their own water conservation programs. The first part of the report contains background information relative to the rationale and need for community water conservation programs. The second part is the Suggested Water Conservation Ordinance itself, stating recommended ordinance text in the left column, with explanatory "commentary" in the right column.

It is understood that each local government may wish to modify the information presented herein to conform to its existing regulations and practices. The Commission will provide technical assistance on request in developing such modifications. The Commission will also assist in modifying existing ordinances to include desirable provisions to the model. In any event, it is important that each local government submit the model ordinances to careful review by administrative officials and legal counsel prior to adoption.

1.02 PURPOSE Most municipal water conservation efforts to date in this country have had droughts or other critical water shortages as the catalysts for their implementation. Shortages during the 1960's in the northeast resulted in widespread conservation actions, as well as feverish attempts to locate and develop new sources of supply. More recently, chronic drought and resultant reservoir depletions in California have precipitated strong conservation and outright control programs.

In contrast, northeastern Illinois has had access to both groundwater and to a Great Lakes' supply, and has been regarded as water-rich. Indeed, until recently, water supply in this region has largely been taken for granted, as reflected

by its low cost in relation to other essential commodities or necessities.

The traditional notion of water abundance in northeastern Illinois has been changing, however, and some communities have already experienced water shortages. In some cases, these have been of short-term duration, attributable to equipment failures. In other cases, they have resulted from localized, seasonal water shortages in response to prolonged droughts. In still others, particularly in "fast-growth" suburban areas, water demands generated by new development have outstripped well or water storage capacities.

Of more chronic concern is the fact that the region has been heavily mining groundwater from the deep sandstone aquifer over the past 20 years. This withdrawal of water at rates in excess of natural recharge has resulted in progressive declines in well water levels, increased pumping lifts, and higher pumping costs. Mining cannot be continued indefinitely, and many suburban communities in the region are faced with the necessity of locating and developing alternative water sources, in addition to conserving their presently available supplies.

Water conservation also is a factor of concern relative to the use of Lake Michigan water. The Lake is the major source of water supply for the region, both in terms of amount supplied and population served. However, under the terms of a 1967 U.S. Supreme Court decision, the amount of water which Illinois may divert from the Lake for all purposes, including natural diversion, is limited to 3,200 cubic feet per second (cfs), which is about 2,070 MGD. This court decision has placed a severe constraint on the use of the Lake as a water supply source.

Provision has been made by the Supreme Court for modification of its decree to allow increased diversion for domestic use. However, a modification can only be made when and if it appears that the reasonable water needs of the region cannot be met from the water resources available to the region, and further, that "all feasible means reasonably available...have been employed to improve the water quality of the Chicago Sanitary and Ship Canal and 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."(1)

This constraint, coupled with the aforementioned groundwater supply problems in many suburban communities, has highlighted the need for water conservation. Some communities have already

(1): Ref. 1

received specific water conservation directives from the Illinois Division of Water Resources, the agency that issues allocation permits for the use of Lake Michigan water. Communities receiving such permits must require the installation of water saving fixtures in all new construction, as well as in the repair or replacement of existing fixtures. Permitees also must enact ordinances to provide for the metering of all new services. Furthermore, they must prepare and adopt comprehensive local water conservation plans, and undertake other activities related to water conservation.

Communities not seeking to use Lake Michigan water are not required to adopt conservation measures but many have done so anyway, with the guidance and support of such organizations as the Northwest Municipal Conference and the DuPage Mayors and Managers Conference.

1.03 FEDERAL POLICIES AND MANDATES The federal government placed increasing emphasis on water conservation during the 1970's:

a. President's Water Policy Message of 1978 This address identified water conservation as a matter of national importance and resulted in several directives being issued to Federal agencies, all with direct bearing on municipal water conservation. Federal agencies are now required to:

   (1) Make appropriate community water conservation measures a condition of water supply and wastewater treatment grant and loan programs;

   (2) Integrate water conservation requirements into Federal housing assistance programs;

   (3) Provide technical assistance on how to conserve water through existing programs;

   (4) Include the development of water conservation programs as a condition for storage or delivery of water supplies from Federal projects;

   (5) Establish water conservation goals and standards for Federal buildings and facilities.

b. USEPA Programs and Requirements Section 204(a)(5) of the Clean Water Act of 1977 requires that approvable amounts of reserve capacities in proposed wastewater treatment

expansions take into account "efforts to reduce the total flow of sewage and unnecessary water consumption." In response, the USEPA's construction grant program's guidelines require evaluation of flow-reducing measures such as plastic toilet dams and low flow showerheads; changes in ordinances, or plumbing codes requiring installation of water-saving devices in future construction; and water pricing changes. In the absence of ongoing flow reduction programs, grantees now must develop a recommended flow reduction program featuring a public information program plus cost-effective measures for which grantees have implementation authority, or for which they can obtain the cooperation of entities having such authority. (Exempted from these requirements are communities with populations less than 10,000. Also exempted are those having average daily flows, excluding infiltration/inflow and industrial loads, for treatment works design of less than 70 gallons per capita per day.)

Another part of the construction grants program is oriented toward industrial pretreatment and user charges based on the volume and strength of wastewaters discharged to publicly-owned systems. Where industries are supplied by public water systems, these provisions provide incentives for water use reduction and for in-plant reuse, both of which should reduce the industrial portion of community water demand.

c. Other Federal Studies A recent USEPA draft report to Congress cited the following findings with respect to municipal water conservation programs:(2)

(1) Nationwide implementation of a modest municipal water conservation program over a 15 to 20 year period could result in annual energy savings (primarily from less use of hot water) equivalent to about three percent of present energy imports.

(2) Even in a community where water conservation causes decreased water sales, the energy savings can pay for needed increases in water rates.

(3) Municipal conservation is especially attractive for growing communities since expenditures to expand both water supply and wastewater facilities can be postponed with substantial savings in interest and future operating costs.

(4) Municipal water conservation is on a threshold; it could be widely and enthusiastically received in the next several years if clear and comprehensive information is made available on its overall advantages and disadvantages so that communities can make informed decisions attuned to their specific situations.

(2): Ref. 2, pg. 17

1.04 RESIDENTIAL WATER USAGE AND REDUCTION POTENTIAL A great deal of water is used in and around the home in the course of normal daily activities. Drinking, cooking, dishwashing, use of household garbage grinders, laundering, personal bathing and grooming, toilet flushing, car washing, and lawn sprinkling are common domestic uses of water. In many cases, these can be overly consumptive since the mechanical devices and/or people themselves use more water than is actually necessary to accomplish the intended purposes.

Generally, in-house uses of water have been found to break down approximatly as follows: drinking and cooking (5%); bathing and personal uses (30%); laundry and dishes (20%); and toilet flushing (45%).[3] These, of course, are averages and do not reflect variations in individual habits or ranges in water-using equipment performance.

Table 1-1 gives an estimate of the average amounts of water used by various fixtures and appliances. Again, the figures are necessarily approximations due to variations in personal habits and differing characteristics of individual makes and models.

TABLE 1-1: APPROXIMATE WATER USAGE FIGURES, RESIDENTIAL FIXTURES AND APPLIANCES[4]

| FIXTURES | USAGE |
|---|---|
| Toilet | 5-7 gal./flush |
| Shower | 4 gal./min. |
| Tub Bath | 30 gal. |
| Dishwasher | 14 gal./load |
| Clothes Washer | 50 gal./load |
| Garden Hose | |
| 1/2" | 360 gal./hr. |
| 3/4" | 1,140 gal./hr. |
| Leakages | |
| 1 drop/second | 7 gal./day |
| Steady drip | 20 gal./day |
| 1/32" trickle | 200 gal./day |

The following are among the techniques and actions which can be used singly or in combination to reduce residential water consumption.

(3): Ref. 3, pg. 7
(4): Ref. 4, pg. 4

a. Toilet Flushing Toilet flushing constitutes the greatest single demand on residential water supply. When operating properly, conventionally designed water closets use about five gallons per flush. If each person in a family of four flushes the toilet four times daily, then water consumption for this purpose alone would be on the order of 80 gallons per day. Poorly functioning or poorly maintained toilets are even more water consumptive, while serving no beneficial purpose. If household toilets are extensively used for the casual disposal of miscellaneous waste products (facial tissues, paper towels, etc.), water usage increases even more significantly.

Many conventionally-designed toilets use more water than is necessary. To reduce the waste caused by overdesign, some homeowners have placed ceramic bricks, water filled plastic bottles, plastic water displacement dams, or other objects in the water closet to displace water which ordinarily would be used for flushing. Another simple method of reducing the amount of water used per flush is to bend the float arm downward to reduce the amount of water stored for flushing. In all of the above actions, caution is required to ensure that the operational efficiency of the toilet is not impaired. For example, excessive alteration of the float arm can reduce the head pressure to a point where there is unsatisfactory cleansin of the bowl. Similarly, any device whose net result is to require more than one flush is counter-productive.

In some newer dwellings (as well as in some older ones in which conventional plumbing fixtures are worn out and need to be replaced) water-saving toilets are being installed. These water-saving models use three to four gallons per flush, although some of the most advanced types use only two to three gallons. It has been estimated that exclusive use of these toilets would decrease total in-house water use by approximately 18 percent(5). The competitively-priced commercially-available water-saving models substantially reduce water consumption, and perhaps more tangibly reflect their value to the homeowner in the form of lower water bills.

b. Personal Bathing Normal tub baths use approximately 30 gallons while a shower of five minutes duration uses about 20 gallons. Shaving, tooth-brushing, and shampooing account for additional amounts, with flows from sink and basin taps ranging from 3 to 5 gallons per minute.

(5): Ref. 3, pg. 9

The most obvious means of conserving water used for these purposes is to consciously limit oneself to only that amount which is absolutely necessary to accomplish the intended purpose. Normal showerheads, for example, deliver water at about 4 gallons per minute. If the shower is turned off for the one to two minutes it takes to lather, 4 to 8 gallons of water is saved. Turning off the tap while shaving or brushing teeth can also reduce water consumption. While the individual impact of these efforts may seem small, their cumulative effect over time can be noticeable.

As is the case with water-saving toilets, manufacturers have also developed and are marketing showerheads with built-in flow control devices. There also is a great variety of simple, flow restricting inserts which can be readily installed on existing fixtures. Although these devices greatly reduce the quantity of water used (to a maximum of about 2 to 3 gallons per minute), they reportedly do no affect bather satisfaction. The additional cost of using these devices in place of conventional fittings is relatively modest and can be recovered quickly through reduced water bills. Control valves are also available for use on kitchen and bathroom faucets, reducing flows to 2 to 3 gallons per minute. Faucet aerators are also commonly used (and readily installed) to reduce splash. These devices reduce flows, without actually seeming to do so.

c. Laundering Automatic washing machines are usually rated to wash 12 to 16 pounds of clothes, using 42 to 45 gallons of water for a complete wash-rinse cycle[6]. An obvious means of saving water is to load the machine to its rated capacity before starting a cycle. Of course, this may not always be advisable or practical. However, "suds-savers", which provide for storage of wash water in a laundry tub during the rinse cycle and then its reuse during a second or third wash cycle, can reduce the total amount of water required. As an alternative, there are water-saving models available, although these units do cost slightly more than conventional types. Increased initial costs can be offset by lower water and energy bills. Water savings can also be realized through the use of machines which allow the amount of water used to be adjusted according to load size, and by using front loading models (which use less water than top-loading units).

d. Outside Water Use Considerable quantities of water may be used outside of the home for lawn and garden care. A 1/2-inch diameter garden hose under normal pressure will deliver water at a rate in excess of 360 gallons per hour. A 3/4-inch diameter hose will flow at nearly 1140 gallons per hour. The

(6): Ref. 5, pg. 6

most effective method of avoiding waste is simply to take care that only the minimum quantity of water necessary is drawn. Studies by the National Water Commission have found water use for lawn sprinkling to be excessive, but also price-sensitive. Usage can be reduced through a combination of improved pricing and educational policies.

e. Other Innovations In addition to the devices noted above, there are other, less common innovations for reducing residential water usage.

(1) Dual Cycle Toilets A number of devices have been marketed which allow existing toilets to be adapted for dual flush cycle actions. With these, a separate cycle is used for solids, while another (with smaller volume) is used for liquid wastes.

(2) Vacuum Systems These systems appear to be potentially attractive for use in multi-family dwellings. Such systems use only about 10 percent of the water required by conventional systems. They employ vacuum pumps to remove wastes from the toilet unit to a holding tank, and thence to a sewer line.

(3) Other Toilet Devices Air-assisted toilets use compressed air to assist the flushing action, and reportedly reduce water use to about 1/2 gallon per flush. Lavatory toilet combinations involve the collection of lavatory sink wash waters in a standard toilet reservoir, where they are subsequently used for toilet flushing. There are also various types of waterless toilets, including gas or electric incinerating units, composting toilets, and toilets using reusable mineral oil as a water substitute. The practicability of such systems for widespread residential application remains to be seen.

f. Water Saving Tips There is a wide variety of other useful things that can be done in and around the home to conserve water. A number of these have been set forth in Appendix A. Information on such measures can be conveyed to local residents through local news releases, municipal newsletters, and other mailings.

1.05 COMMERCIAL AND INSTITUTIONAL WATER DEMANDS AND REDUCTION POTENTIAL Commercial water demands very considerably among municipalities but generally fall in the range of 5 to 20 percent of total municipal output.(7) Reduction potential for this user

(7): Ref. 6, pg. 95

sector centers on the development of new technologies and processes which allow reuse or recycling of water, or actual reductions in minimum requirements.

Little action has been taken in this direction to date. The general abundance of water has indirectly contributed to this inadequacy. Furthermore, under most current pricing systems, it has been more economical for a firm to use more water than to invest in water conserving capital equipment.

This is not to say that conservation measures have not been employed. Car washes and commercial laundries in particular have installed recirculation equipment when conditions warrant. Hospitals have also on occasion introduced new facilities which reduce the volume of water required. However, both hygienic standards and the widespread practice of furnishing water free of charge to hospitals has limited experimentation with water conserving processes unless required to do so by local ordinances.

Another of the Illinois Division of Water Resources' conditions for receiving Lake Michigan water is a provision which requires local ordinances to mandate that new car washes (and replacements at existing car washes) be equipped with recycling systems on the wash and rinse cycle units.

1.06 INDUSTRIAL CONSERVATION-RECYCLING MEASURES Some industries require large quantities of water which may be withdrawn from private wells, surface watercourses or public supplies, depending upon process needs and source availability. Many industries take their cooling and process water from adjacent water bodies. If their use is relatively non-consumptive, a large portion of the water withdrawn is returned to the streams and is available for further use. Nonetheless, industries can conserve water in a variety of ways, including improvements in the physical efficiencies of water using equipment, greater reliance on in-plant recycling, use of wastewater treatment plant effluent where practicable, and conversion to alternative water sources which are not used for public supply.

The development and refinement of industrial recirculation systems is expected to have one of the more profound and far-reaching influences on future demands for water supply, particularly in industries where the quality of process water is not a critical factor. Additional motivation in this direction is expected to come from more stringent industrial wastewater effluent standards and the attendant costs of providing adequate waste treatment prior to discharge. As the requirements and costs for wastewater treatment increase, a continuing re-examination of the economic factors of industrial reuse can be expected. As greater confidence is

is achieved in new treatment technology, there will be greater reuse. However, decisions will still be based on economics and reliabilities of each particular situation.

Of the more significant physical problems associated with industrial water recirculation are those relating to water quality and temperature. Industrial water not in a closed distribution system will have its quality changed as it comes in contact with various components in the manufacturing process. These changes may make the water unsuitable for subsequent use in the distribution system. Partial treatment of this water within the system may be less practical than greater use of raw water from the original sources. High hardness, phosphates, sulfates and total solids notably cause problems in some systems. In food processing particularly, extreme care must be exercised to prevent water contaminated in one phase of the operation from coming in contact with food in a subsequent phase. Chemical and metal processing industries presently are doing the most recirculating while food processors are doing very little.

1.07 METERING Metering water consumption is one method of encouraging conservation and normalizing water demand in a community. Metering allows consumers to be charged according to the amount of water they use, thus providing an economic incentive to minimize waste, particularly when coupled with rate schedules which increase with the amount of water used. Metering is regarded as one of the most fundamental precepts of modern water management. Yet, a number of public water systems in the region do not meter consumption and charge a flat rate for water, regardless of the amount used. Of the nearly 400 public water supply systems operating in northeastern Illinois, over 60 still utilize the flat rate method.(8) While the vast majority of these systems are subdivisions or franchised private utilities with comparatively small populations and service areas, a number are municipalities. The most significant of these is the City of Chicago, where single and two-family dwelling units are not metered.

With flat rate billings, there is virtually no economic incentive to practice water conservation. Yet, it is recognized that the cost of purchasing, installing, maintaining and reading water meters is substantial. For example, in 1976, the City of Chicago estimated the costs of installing meters in its 345,000 unmetered one and two-family dwellings as $85 million.(9) Annual costs of maintenance, reading, and repair were estimated at $5-$10 million. Thus, it may not be economically feasible to meter all service connections that are presently unmetered. However, metering can be instituted on a phased basis, with initial program emphasis placed on known large water users. Meters also can be required for all new construction by local plumbing codes.

(8): Ref. 6, pgs. 62-90
(9): Ref. 7

It should be noted that reductions in water usage as a result of metering policies have not always been permanent. In certain areas, the institution of universal metering has resulted in significant reductions in water use initially, only to be followed by a return to pre-metering consumption levels as consumers gradually returned to old habits and practices.

At least in the case of residential water use, metering may have a greater impact on water supply quantities than on wastewater volumes. This is due to the fact that metering generally has its greatest influence on "extraneous" uses such as lawn sprinkling, the flows from which ordinarily do not enter the sanitary sewer system. Nevertheless, metering would be expected to have some impact on in-house water uses that are tributary to sewers by influencing such things the correction of leaks through plumbing fixtures.

Metering by itself may not result in water savings. It may be necessary to implement certain other measures, such as conservation pricing systems and mandatory rationing programs. Metering also is of value for long-range planning purposes since it enables useage trends to be spotted. Meters also are of value in identifying system losses due to pipeline leaks and other unaccounted uses.

1.08 PRICING In commodity terms, water is much underpriced in relation to what people actually would be willing to pay for it. The virtual absence of an effective price mechanism to influence demand can give rise to unnecessarily high water use. In a region such as northeastern Illinois, where there is increasing concern for the future availablity of water for domestic consumption, it is useful to consider the extent to which pricing structures might be utilized. Certainly if more stringent pricing schedules were established, there would be greater incentive to practice conservation. Individuals would be better motivated to balance the value of water used with its cost.

The effect of pricing on water use is highly dependent on local conditions. The response to price changes has been found to vary with the type of water use.(10) Commercial water-using establishments such as laundries and car washes are generally sensitive to price increases, and are able to incorporate water-saving technologies into their processes. Pricing response to water use in manufacturing is highly variable depending upon the type of industry, the industry's process requirements, and the physical design of the plant. Since the major component of industrial use is for cooling purposes, higher prices would

(10): Ref. 8, page 7-60

probably influence adoption of water-conserving cooling systems.

The majority of communities in northeastern Illinois still use "declining block" water pricing schedules in which users pay less per unit of water as more is used. With this system, the user is assessed a minimum charge on a monthly, bi-monthly, or quarterly basis for a specified quantity of water. If that quantity is exceeded during the billing period, the user is charged for the amount used, but at a lower rate than the initial base rate. The rate schedule may be structured so as to provide for a number of charge categories, with each unit charge being successively lower as the amount of water used increases. Such rate schedules, primarily benefiting large water users, discourage water conservation efforts. For example, with such a system, residential customers are permitted to pay less per unit of water for lawn sprinkling while at the same time burdening the waterworks system at critical times with high peak demands. In such a situation, water prices are lowest when incremental costs are highest. As a result, certain individuals have proposed imposition of a demand charge as a possible means of curtailing high seasonal or intermittent uses. Still others have abandoned the "declining block" structures in favor of rate schedules which increase with the amount of water used.

On the basis of information presently available, current pricing policies do not have a significant influence on per capita water use in northeastern Illinois. This again suggests that current price differentials in most communities are not sufficient to stimulate widespread conservation. In connection with previous technical studies of water supply conducted by this Commission, a regression analysis was made of the minimum and maximum rates charged by a number of communities and utility companies, comparing those rates with per capita water consumption. No correlation was found to exist between the two factors. More specifically, it was found that less than one-half of one percent of the lowest rates, and only one percent of the highest rates had any correlatio to per capita consumption.

This Commission also conducted a survey of then-prevailing rate schedules in 1974. Minimum water rates were found to vary among communities from as little as $0.17 per 1000 gallons to $1.50 per 1000 gallons.(11) Maximum rates ranged from as low as $.36 per 1000 gallons to $3.21 per 1000 gallons. For 90 percent of the public water supply systems in operation, minimum rates were less than $1.00 per 1000 gallons and maximum rates were less than $1.50 per 1000 gallons. While rates have increased in most communities in the intervening years, they are still quite low in relation to those paid in other parts of the country, and in relation to the rates paid for other utility services.

(11): Ref 6, pgs. 62-90

1.09 UNACCOUNTED WATER LOSSES AND UNAVOIDABLE LEAKAGE In any water distribution system, not all of the water flowing through the system can be accounted for as to how it is used. Water used for street cleaning, hydrant flushing, and fire-fighting are typical unaccounted flows. In addition, some water is lost due to unavoidable leakage, which varies according to system age, pressures, type of pipe and joints, and other factors. As part of its Lake Michigan water allocation permit requirements, the Illinois Division of Water Resources (IDWR) has established maximum limitations on unavoidable leakage, depending upon system age and the type of pipe and pipe joints in use.

In order to determine what percentage the unaccounted water is of total flow, water auditing procedures should be established. If the water audit reveals that the proportion of lost water is excessive, corrective programs should be instituted.

The IDWR also has established as a Lake Michigan water permit requirement that unaccounted flows shall not exceed 12% in 1981, decreasing to 8% in 1986 and thereafter, based on net annual pumpage within each user's system. Research conducted by IDWR indicates that in communities receiving Lake water allocations, unaccounted flows in 1978 ranged from less than 5 percent to as high as 49 percent of total water used.(12)

1.10 HOUSEHOLD LEAKAGE CONTROL Water losses from residential leakage can be significant, particularly in non-metered areas where incentives for leakage control are generally lacking. Some studies have indicated that leakage routinely may account for as much as 5 to 10 percent of total residential water consumption.(13)

The most prevalent (and least readily detectable) household leaks are in toilets. Severe leakages from these fixtures can amount to as much as 200 gallons per day, usually as a result of worn valves, poor tank ball seatings, and maladjusted tank floats. Free public distribution and encouraged use of colored dye tablets have proven to be an effective means of allowing homeowners to identify otherwise-unnoticed leaks. Usually all that is required to correct the problem is the replacement of the flush ball or the valve seat. In other cases, simple adjustments to the float rod or replacement of the float may be necessary.

In the case of leaking faucets, the loss of water is clearly visible to the individual, often to the point of being distracting. In most instances, these leaks are the result of worn faucet washers, a condition readily corrected by washer replacement.

(12): Ref. 9, pg. 8
(13): Ref. 4, pg. 3

1.11 FREE WATER Another deficiency that could be remedied to produce tangible results relates to the relatively widespread practice of furnishing water and sewer service free to schools, hospitals, municipal buildings, and other related accounts. Although this practice might be rationalized as being in the civic interest, it does little to encourage conservation on the part of these activities, which are frequently found to be high water users. Consideration should be given to billing all users for the services furnished.

1.12 PRESSURE REDUCTION VALVES While low water pressures are a frequently-cited homeowner's lament, abnormally and unnecessarily high water pressures also can pose problems from a water conservation standpoint. In high water pressure areas (with pressures in excess of 50 to 60 psi) the use of pressure reduction valves has decreased water delivery and leakage in household lines. In the Washington (D.C.) Suburban Sanitary Commission's service area, the plumbing code has been amended so that pressure reduction valves are required on household water inlets wherever pressures exceed 60 psi. That Commission anticipates a 33 percent reduction in water flow in their system as a result of this requirement.(14) Given that the minimum advisable household water pressure is on the order of 20 psi at the tap (based upon the needs of various water using fixtures and appliances), it would appear that a wide range of system pressures and water savings is possible.

1.13 ENERGY CONSIDERATIONS The cost of residential and most other water use is reflected both in the municipal water bill and in that portion of the gas or electric bill attributable to water heating. Next to home heating, hot water heating represents the greatest use of residential energy. If hot water use is reduced, there is a corresponding reduction in energy use, which is a consideration of obvious increasing importance. Indeed, the Great Lakes Basin Commission has predicted that in the short-run at least, the biggest monetary savings from household water conservation will be reflected by reduced energy costs for heating water. Still others have suggested that the energy savings resulting from the use of water conserving devices may alone justify their installation.

As energy considerations become more important, it is likely that the energy conservation and water conservation interface will increase. This is particularly true as more states and local governments adopt energy performance standards and codes for building construction. Low flow showerheads and faucets (either retrofitted or in new construction) have resultant benefits from both water and energy conservation standpoints, and are likely to be increasingly adopted as elements of both types of codes. Insulation of hot water tanks and piping also will result in dual benefits.

(14): Ref 10, pg. 31

1.14 COST-EFFECTIVENESS CONSIDERATIONS Recent studies conducted for the USEPA indicate that several water-saving devices are cost-effective.(15) Even in retrofitting programs, toilet displacement inserts and dual cycle toilet modifications have been found cost-effective. Water-saving toilets appear to be cost-effective in new construction. Also thought to be economically justified are municipal programs which involve distribution of inexpensive water-saving devices (such as shower flow control inserts and leak detecting dye kits).

Preliminary studies conducted by the USEPA indicate that potential savings for existing households that install water conservation devices are on the order of $54 per year in terms of water and energy costs. New houses designed for maximum water conservation might save as much as $96 per year, assuming a conservative constant cost for water and energy.(16)

Despite an initial reluctance to alter product lines, most major manufacturers have now developed a range of water saving fixtures and devices. Furthermore, these are being marketed at prices which are competitive with those of traditional fixtures. Indeed, the water conservation fixture market itself has become very competitive as manufacturers seek to capture greater percentages of sales as water conservation ordinances are being enacted across the country on a widespread scale. No economic or other hardship should be anticipated from the adoption of the water saving device and fixture provisions of the model ordinance contained in this document.

1.15 IMPACT ON WASTEWATER COLLECTION AND TREATMENT SYSTEMS The effect of conservation programs on wastewater flows is dependent upon how potable water use is conserved. Total water demand is composed of a number of different uses: industrial, commerical, institutional, domestic, fire fighting, and system leakages. Domestic demand is further subdivided into sanitary, bathing, kitchen, laundry, and lawn sprinkling uses. Water conservation measures would impact on all of these uses, but not all would affect wastewater collection and treatment requirements. Conservation measures related to the control of system leakages and lawn sprinkling would have no effect on wastewater flows.

a. Collection The primary concern relative to the wastewater collection system is that reduced wastewater flows would be insufficient to maintain scouring velocities in sewers designed for higher flows. Sewer designs are normally based on peak flow rates with a peaking factor which ranges between 2-4 times average daily flow. The impact of conservation on peak flows would approximate the percent reduction in potable water supply demand. Thus, if peak daily flows in a sewer system were 2.5 times average daily flows before water conservation, and 15 percent reduction in the water supply demand was accomplished, peak daily flows would still be sufficient to maintain scouring velocities.

(15): Ref. 10, pg. 102
(16): Ref. 11, pg. 67

Infiltration and inflow (I/I) would add additional flows to prevent the prolonged deposition of sewage solids.

In the case of newly constructed systems, the influence of water conservation could result in lower design flow figures and smaller pipe diameters. The cost savings would be reflected in the smaller pipe sizes but would probably not be significant. Conservation may have other site-specific beneficial impacts accruing from reduced wastewater pumping costs and increased available sewer capacity.

b. Treatment The potential impacts of conservation programs on wastewater treatment plants are manifested primarily in the design of new facilities and in the operation of existing facilities. In the case of new plants, it may be assumed that a designer would take the effect of existing water conservation ordinances into consideration in the sizing of treatment units.

Proposed facilities could be sized for smaller wasteloads than if no water conservation measures were in effect. The range of values for design parameters such as flow and pollutant loads should not be out of the ordinary and no special design problems would be anticipated. From an operational viewpoint, no unusual problems would be likely.

Existing facilities might face operating difficulties related to increased pollutant concentrations, although total pollutant loads would be unaffected. Concentrations of pollutants would be somewhat higher on the average, due to reduced water dilution. However, the impact that these higher concentrations would have on the operation of treatment facilities would be mitigated by a number of factors. First, any change in water use patterns would not be immediate but would occur over a number of years. The change would be so gradual that normal adjustments in operating procedure would probably handle any shifts in wasteload concentrations. Second, any well designed treatment facility must be capable of handling peak daily organic loads of more than 1.5 times average loads and peak hourly organic loads well in excess of this ratio. Any fluctuations in wasteload concentration would probably be small enough to be absorbed by the plant without any adjustment at all.

Increased pollutant concentrations could conceivably create problems in meeting a fixed effluent standard. As the average daily influent concentration of pollutants rises, the percent removal must also increase if a fixed effluent standard is to be met. For example, with an effluent standard of 10 mg/l BOD, treatment efficiency must rise from 93 percent to 97 percent as influent BOD increases from 150 mg/l to 350 mg/l. However, it is possible that many plants could make adjustments to their operating parameters to meet this increased

demand. The increased efficiency of clarifiers and filtration equipment resulting from smaller hydraulic loads would also help to make up the increased removal demand. The issue of a fixed effluent concentration raises a fundamental question of equity as regards water conservation and also control of infiltration and inflow. Any reduction in water usage and I/I will lead to increased pollutant concentrations because of decreased flow. However, treatment facilities must remove a greater percentage of their total pollutant load in order to meet a fixed effluent concentration. Dissovled oxygen requirements may increase in order to provide effective stabilization of the higher organic concentration.

1.16 BENEFITS TO ON-SITE DISPOSAL SYSTEM USERS The use of conservation devices and adoption of conservation habits can result in significant tangible benefits to homeowners having their own wells and septic disposal systems. Researchers at the University of Illinois have concluded that as much as a 40 percent reduction in wastewater flows may be possible for such systems.(17)

1.17 PUBLIC INFORMATION AND EDUCATION Municipal water conservation programs have been widely implemented in California, Colorado, and the eastern United States. More recently, they have been extensively adopted in northeastern Illinois. In all such programs, the single-most important feature recognized as the key to success has been an effective public information and education program.

The overall purpose of any information and education program should be to convince residents of the need for water conservation in the community. The reasons necessitating conservation should be stressed so the public will clearly understand that the program being proposed is not arbitrary. This is particularly important if conservation is to be aggressively pursued through such means as altered water rate structures, sprinkling bans, and plumbing retrofits. The adverse consequences of failure of the conservation program should also be outlined in terms of alternate scenarios.

Wherever possible, the positive attributes of water conservation should be highlighted. Consumers should be advised that water-saving fixtures are no more expensive than conventional models, while operating just as efficiently. Financial savings in terms of reduced water and sewer bills and reduced costs of hot water heating should also be emphasized as appropriate. Then too, if conservation can be identified as a means of forestalling capital investment in such things as new wells or water storage facilities, this should be clearly indicated as a governmental (and taxpayer) economic benefit.

Local information programs should stress the need to adopt a conservation ethic on the part of residents, an achievement which might not be too difficult in this period of economic and energy

(17): Ref. 4, pg. 2

concern. In particular, the fact that water is not a "free good" should be emphasized. Most residents generally give little thought to their water use habits until faced with actual shortages or substantial rate increases. This complacent attitude needs to be changed if conservation is to be effective.

The City of Elmhurst is one of several communities in northeastern Illinois which have developed extensive public information programs as elements of their conservation efforts. The Elmhurst program included the mailing of flyers along with water billings explaining the need for water conservation in the community. Routine newsletters were distributed which detailed the measures to be employed. Additional efforts were made to gain exposure through local newspapers and the local radio station.

Other aspects of the Elmhurst program included door-to-door delivery of toilet displacement dams, accompanied by an offer to install these devices if requested. Low flow showerhead inserts and toilet leakage detection dyes were also distributed to homeowners. Still other activities included printed advice to residents on proper lawn and garden sprinkling and related lawn care information.

Section B: CONTINGENCY PLANNING FOR WATER SHORTAGES

1.18 INTRODUCTION Some municipalities have found it desirable to adopt contingency plans for water management which may be placed into effect under emergency or other adverse conditions. These circumstances may range from acute incidents, such as major equipment failures, tornadoes, fires, or other catastrophic accidents down to chronic situations which become progressively worse over time. The latter include such things as droughts, decreasing raw water supplies or increasing consumption. Emergency operational plans prepared in advance will permit situations to be met with a minimum of confusion, according to prepared options, and in accordance with deliberately planned remedial and restorative measures. While this paper addresses water conservation under normal conditions, the concept could be an element of a broader-based contingency plan of a community which, under varying conditions, involve most (if not all) of the elements of local government. A description of optional elements of such a plan is included in the water conservation subsections that follow.

1.19 DISASTERS AND OTHER EMERGENCIES Major disasters invariably involve destruction of buildings, occurrence of fires, generation of considerable debris, destruction of utilities, and incurrence of casualties. Broken water mains and ruptured service lines may decrease water pressure required for fire fighting, and the hygienic quality of remaining water service (particularly in the affected area) may be compromised or be placed in doubt.

a. Missions The primary missions of water utility personnel when disasters occur should be to:

(1) Provide adequate supplies of water for fighting fires.

(2) Develop or maintain sufficient amounts of water to meet minimum requirements for health and hygienic purposes.

(3) Prevent losses of treated water from the system.

(4) Restore the integrity of the system as soon as possible.

(5) Keep local citizens informed of problems, precautions, and of self-help actions.

b. Actions With respect to water conservation, the primary action should be centered on the closure and repair of broken lines. Depending on the severity of the situation and the time required to restore reasonable service, available water may be limited and localized restrictions may be imposed to equitably distribute available supplies. The affected area must be defined, customers informed of the conservation measures which are encouraged, or advised of the limitations which will be imposed and enforced. Emergency action crews, special equipment or supplies, emergency communications networks and preplanned announcements should be available so as to expedite the corrective and preventive measures.

c. Plans An emergency operational plan should be prepared which assigns duties and responsibilities to each level of workers, supervisors and managers. The plan itself should be concise, useful for guiding operations, and designed to permit trained personnel to make on-the-spot decisions. It should be based on alternate assumptions of emergency situations, with priority actions identified for a specific type of disaster. Naturally, flexibility also must be provided to deal with problems on a case-by-case basis. Interactions with related municipal services should be defined, to include police, fire and civil defense authorities. Emergency operational plans may include a very detailed listing of necessary actions, but as a minimum should, include the following:

(1) Inventories: An adequate supply of replacement parts, meters and repair equipment should be on hand to make large area emergency repairs following disasters.

(2) Standby Power: Standby power should be available, both fixed and portable, which will permit the system to operate and the emergency repair activities to be conducted in the absence of commercial power.

(3) Communications: Alternate communication systems should be available, including two-way radios to facilitate communications to, from, and within the disaster area.

(4) Chlorination: Increased dosages may be required because of hazards associated with line ruptures, leaks, etc.

(5) Pressure Drops: Increased awareness is required to monitor in-line pressures to identify drops so as to isolate breaks or leaks.

(6) Shut Offs: Water mains and curb stops should be shut off in the affected area during rescue and clean-up activities except where water is needed for fire fighting.

(7) Salvage: Utility personnel should be on hand to salvage expensive items of equipment such as meters and hydrants, and to prevent further damage during clean-up operations.

(8) Temporary Service: Reasonable temporary service should be reinstituted to customers as they move back to make-shift homes and to commercial and industrial activities which may begin operations under temporary conditions.

(9) Bacterial Quality: Programs should be started to check water quality in various sections of the distribution system which may have been affected by the disaster.

(10) Billing System: If meters have been destroyed, a billing system should be prescribed which will be based on estimat which, in turn, will be based on records of past consumpti

(11) Boiling Instructions: In the event potable water is not available, local citizens should be informed of the requirement to boil water for consumption, to include boiling time and any other emergency purification activities which might be undertaken by individuals.

d. Vulnerability Studies In anticipation of actual emergency actions, vulnerability studies should be made which will confirm the availability and the location of detailed system maps, stockpiles of materials and supplies which might be needed, auxiliary power equipment, sources of gasoline and diesel fuel, locations of keys, identification of specialized vehicles and loading equipment which may be required, and alternative actions or sources. In the final analysis, some of these items might be collected, prepared and earmarked in advance and separately stored Practice alerts can be called, preferably in connection with real-life, immediate action situations. Weak points and deficiencies can then be identified, together with critical impacts which might result if certain key people, including the equipment operators and skilled tradesmen, are unavailable. Other vulnerable points include situations where ready access cannot be gained to equipment or supplies because of locked storage areas, the inability to fuel vehicles or equipment because of absence of commercial power to operate gasoline pumps, and the absence of

of decentralized authority to act in emergencies if key people are not available.

1.20 CHRONIC SHORTAGE CONDITIONS Under these conditions, general or localized diminishing supplies of raw or treated potable water may be the cause of the adverse situation. At other times, decreased water pressure, in all or certain sections of the system, diminishing stocks of critical water treatment chemicals and other related operating factors will give early warning of deteriorating conditions. The conditions normally will be observed by responsible employees and higher supervisors, and political leaders should be forewarned. By pre-planning emergency preventive, corrective or remedial action, all that remains to be done is to decide the timing for instituting the emergency actions. A concurrent decision would involve the level of available alternative actions which should be first implemented.

a. Mission The primary missions of water utility personnel should be to:

(1) Provide minimum quantities of water for essential necessities, including those pertaining to safety, health and economic well-being.

(2) Conservation of available raw and treated waters and of critical chemicals.

(3) Restoration of normal service as soon as reasonably possible.

(4) Keeping local citizens informed of problems, precautions, self-help actions, and of possible mandated actions which may take place, together with penalties for violations.

b. Actions With respect to water conservation, action should be taken in advance (with long lead-times) alerting people as to voluntary conservation measures which should be taken at the individual level. Alternative municipal plans should be described, published and/or distributed, so there will be no misunderstanding as to what will be required of individual citizens if emergency conservation actions are mandated. The roles of other municipal services and departments should be clarified, particularly if bans might be imposed on lawn watering, filling of swimming pools, and limiting supplies to heavy water using industrial or commercial enterprises.

c. Plans Contingency plans should be prepared and evaluated as to impacts on the conservation of water supplies. Public pronouncements on their implementation should be prepared and enforcement procedures specified. If official limitations on water use are to be implemented, the details as to hours involved, or the relationship of calendar days to odd and even numbered street

addresses, should all be known to citizens beforehand. The role of police departments in issuing citations to violators should be clearly understood. All municipal employees in particular, and citizens in general, should be alerted for the reporting of broken water mains or of conditions which indicate that such ruptures may exist. Press releases, printed inserts to utility bills, and even educational materials for use in schools can be used. These will permit available water conservation options to be employed over time, with a minimum of delay and confusion, once the decision is made. In that connection, municipal ordinances should clearly state the level of authority by which such conservation measures will be placed in operation. Restrictions on other municipal departments which may be heavy users of water should be pre-planned. These include such water consuming activities as street washing, hydrant testing, and fire training exercises. Conservation measures which might be undertaken by industrial water users should be negotiated in advance and codified if there are sufficient number to warrant such actions. Otherwise they may be handled through administrative correspondence or trade channels.

d. Vulnerability Studies In anticipation of actual emergency actions of this type, vulnerability studies should be made to evaluate the possible or desired effectiveness of alternate water conservation measures. In real life situations, the results of actual conservation measures may or may not conform to the estimates contained in plans. Thus, supplementary measures may have to be enacted. Included in the latter may be such actions as: the complete banning of certain water uses; the assignment of water quotas to individual metered customers; the imposition of emergency rates which will assess customers who exceed their quotas at increasing rates; and other procedures which will impose progressively more severe restrictions and/or penalties for violators as an emergency situation deteriorates. Impacts of reduced water use should be evaluated in advance, together with costs to customers, impacts on debt service, and impacts on other utilities, such as the sewer system and wastewater treatment plant

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# SUGGESTED WATER CONSERVATION ORDINANCE

| ORDINANCE | COMMENTARY |
|---|---|

AN ORDINANCE AMENDING ARTICLE(s) _____ OF CHAPTER(s) _____, OF THE MUNICIPAL CODE OF (GREENDALE), ILLINOIS OF _____(Date)_____, AS AMENDED.

Be it ordained by the (President and Board of Trustees) of the (Village of Greendale) that Article(s) _____ of Chapter(s) _____ of the Municipal Code of (Greendale) of _____(Date)_____, as amended, be hereby further amended to read as follows:

The pertinent elements of the plumbing, building or other municipal code should be specified. Amendments to more than one code may be needed if all the stipulations of the model ordinance described below are adopted locally.

In this suggested ordinance, we have used the words "Village", "Board of Trustees", and "President" for descriptive purposes only. Appropriate substitutes should be made by the particular local governmental unit considering adoption of this ordinance. We have also used "Greendale" as a fictitious community to facilitate reading.

ARTICLE 1 - WATER CONSERVATION FIXTURES AND APPLIANCES

Section 1.01: PLUMBING FIXTURES

Plumbing fixtures in all new construction, as well as replacement fixtures in existing construction, shall not exceed the following established flow rates and/or water usage criteria (based on water pressures at the fixture of 40 to 50 pounds per square inch (psi) ):

| | | |
|---|---|---|
| Tank-type water closets | 3.5 | gal./flush |
| Flushometer-type water closets | 3 | gal./flush |
| Tank-type urinals | 3 | gal./flush |
| Flushometer-type urinals | 3 | gal./flush |
| Showerheads | 3 | gal./min. |
| Lavatory sink faucets | 3 | gal./min. |

ARTICLE 1 - WATER CONSERVATION FIXTURES AND APPLIANCES

Section 1.01: PLUMBING FIXTURES

This section provides maximum water usage figures for various plumbing fixtures, and is intended to apply to all new construction and also to fixture replacements in existing structures. The maximum water usage figures cited are generally accepted "rules-of-thumb" that have been typically specified in water conservation ordinances adopted by other communities. They are also the maximum figures allowed by the Illinois Division of Water Resources in connection with Lake Michigan water allocation permits. Depending upon specific local conditions, problems, or issues, individual communities may desire to modify these figures to suit local needs.

| ORDINANCE | COMMENTARY |
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| Section 1.02: PUBLIC RESTROOM LAVATORY FAUCETS Restrooms intended for public use shall be equipped with metering or self-closing lavatory faucets. This shall apply to all new construction as well as to all replacements of faucets. | Section 1.02: PUBLIC RESTROOM LAVATORY FAUCETS This is designed to reduce the casual and wasteful use of water in facilities used extensively by the public. |
| Section 1.03: COMMERCIAL CAR-WASH FACILITIES All new commercial car-wash facilities shall be equipped with an approved water recycling system on both the wash and rinse water units. All existing commercial car-wash facilities shall be equipped with such recycling systems when the systems are replaced. | Section 1.03: COMMERCIAL CAR-WASH FACILITIES Commercial car-wash facilities have high water use requirements. Recycling systems on these facilities are feasible, and many newer installations are so-equipped in their original design. This is also a requirement of the Illinois Division of Water Resources in connection with Lake Michigan water allocation permits. |
| Section 1.04: PRESSURE REDUCTION VALVES Pressure reduction valves shall be required on all supply inlets where the pressure regularly exceeds (60) pounds per square inch. | Section 1.04: PRESSURE REDUCTION VALVES These devices have proven effective in system leakage control, where pressures exceed 50 to 60 psi. It is recognized that certain industrial and commercial water users may require high pressures to sustain their processes, and variances may be granted in these cases. |
| Section 1.05: WATER METERS All new water services shall be metered. In the case of new single-family attached and multiple-family dwelling units, the water service lines from the exterior water main to the structure containing the dwelling units shall be metered. | Section 1.05: WATER METERS This ordinance provision is appropriate for adoption in communities where universal metering is not already being practiced. |
| Section 1.06: WATER SOFTENERS No new residential water softners may use more than (75) gallons during the entire regeneration cycle, and must be sized to regenerate no more than (three) times per week. | Section 1.06: WATER SOFTENERS This ordinance provision is applicable to communities where well water is the source of supply, and household water softening units are in use. |

ARTICLE 2 - EMERGENCY WATER USE

Section 2.01: NATURAL DISASTERS, CONFLAGRATIONS OR MAJOR ACCIDENTS Emergency procedures in the event of a natural disaster, conflagration or major accident will involve the actions listed in this Article for the protection of public health and property.

Section 2.02: SHUTOFFS All mains and curb stops in the affected area not needed for emergency service will be shut off by water utility personnel during rescue operations and prior to cleanup activities.

Section 2.03: SALVAGE All meters, fire hydrants and other water utility service equipment will be protected against further damage during cleanup operations, salvaged, and returned to stocks for inspection, repair and reuse.

Section 2.04: CHLORINATION In the event service mains are ruptured or are suspected of having been damaged, water utility personnel may increase the dosage of chlorine in treated potable water. Public notices will be given of this action, together with the expected duration.

Section 2.05: BOILING OF WATER In the event the safety or integrity of potable water service is compromised by line breaks or equipment malfunctions, citizens will be advised to boil their water used for potable purposes. Public notice of this recommended action, together with

ARTICLE 2 - EMERGENCY WATER USE

Section 2.01: NATURAL DISASTERS, CONFLAGRATIONS OR MAJOR ACCIDENTS In all emergency situations the protection of human lives and property will have the highest priority.

Section 2.02: SHUTOFFS The intention is to conserve water, prevent further damage and facilitate search and rescue activities.

Section 2.03: SALVAGE The intention is to reduce incidental damage during cleanup operations.

Section 2.04: CHLORINATION Increased chlorination is an additional factor of safety to assure a safe supply of water. Portable chlorination units may transported to the impacted area and used for this purpose.

Section 2.05: BOILING OF WATER Usually, boiling for at least 20 minutes is recommended to destroy any bacteria.

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| boiling instructions will be given. Police and other municipal employees and equipment may be employed in making announcements in the affected area, posting of public notices and issuing news releases. | |
| Section 2.06: BILLING Whenever water meters are damaged or destroyed, billings for water consumed since the last meter readings will be based on prorated estimates of past consumption during the same season of the previous year. | Section 2.06: BILLING In times of personal stress, municipal authorities may wish to reduce the financial impact by basing the estimates of consumption on historical data, such as the lowest recorded use during the past year. |
| ARTICLE 3 - CHRONIC SHORTAGE CONDITIONS | ARTICLE 3 - CHRONIC SHORTAGE CONDITIONS |
| Section 3.01: CHRONIC SHORTAGES Procedures described in this Article are for circumstances related to the development of chronic shortage situations, such as seasonal water shortages, pressure drops, or increased consumption. | Section 3.01: CHRONIC SHORTAGES If water shortages or pressure drops are caused by accidents, equipment failures, or other acute happenings the provisions of Sections 2.01 through 2.06 would apply. |
| Section 3.02: DECLARATION The declaration of a chronic shortage situation will be issued by the (Village President), explaining the situation, the expected duration (if such is reasonably possible), the sequential actions which will take place and the penalties for violations. The actions will remain in effect until rescinded. | Section 3.02: DECLARATION It may be desirable for the declaration to be made by the Village board. Or, the responsibility may be assigned by the ordinance to the director of the water utility or other local official. |
| Section 3.03: LAWN AND GARDEN WATERING Watering of lawns and gardens initially will be restricted to between (8:00 pm and 8:00 am). Occupants with even numbered residences or other structures will be permitted to water lawns and gardens on even numbered days, and occupants of odd numbered residences or other structures, on odd numbered days. By administrative proclamation, following the issuance of the initial declaration, all lawn | Section 3.03: LAWN AND GARDEN WATERING Complete banning of outside water use may be called for by the ordinance. If a complete ban is to be enacted by an administrative proclamation, the authority delegated that responsibility should be named in the ordinance, i.e.: mayor, manager, director of the water utility, etc. The actual hours prescribed for watering may differ from those set forth here. Nighttime hours are |

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| and garden watering may be prohibited if conditions warrant. | preferred, however, to reduce evaporation losses and also to minimize conflicts with other demand uses. |
| Section 3.04: SWIMMING POOLS The refilling of swimming pools will be prohibited until further notice. | Section 3.04: SWIMMING POOLS This prohibition may be included in the initial declaration or announced later if the situation deteriorates. |
| Section 3.05: MUNICIPAL CONSERVATION PROGRAMS All municipal departments will be enjoined to restrict activities calling for heavy water consumption. Included in this category are the testing and clearing of fire hydrants, the cleaning of water mains, the conduct of fire drills, street washing, sewer flushing and the watering of public areas. | Section 3.05: MUNICIPAL CONSERVATION PROGRAMS Municipal departments must cooperate by postponing heavy water using activities. |
| Section 3.06: MAJOR INDUSTRIAL AND COMMERCIAL WATER USERS The (general manager of the water utility) will review water consumption records, and identify the major industrial and commercial water users. The latter will be consulted in advance and their assistance solicited for the development of alternative water conservation measures which may be voluntarily implemented during shortage situations. When a shortage arises, these heavy water users will be required to implement the previously prepared plans to such reasonably practical degrees as will not impose serious economic hardships. | Section 3.06: MAJOR INDUSTRIAL AND COMMERCIAL WATER USERS The preparation of alternative water conservation plans will require diplomacy, peer pressures, facts, and reasoned judgment on the part of all concerned. In place of the term "general manager of the water utility", appropriate language should be inserted to identify the title of the official applicable in an individual village or city. |
| Section 3.07: INCREASING BLOCK WATER RATES In the event of prolonged and serious shortages, the (Village President), may institute a previously developed, adopted, and publicized program which prescribes increasing block rates for water consumed over pre-established levels. | Section 3.07: INCREASING BLOCK WATER RATES The adoption of "increasing block" water rates, whereby the price of water increases as the volume used increases, is being widely implemented as a water conservation tool. While set forth in this ordinance as part of the "chronic shortage conditions" provisions, communities may wish to institute an increasing block rate structure |

as a regular feature of their public water supply service. Increasing block rates should be established at a level sufficient to generate participation in the community's overall water conservation program.

Another pricing alternative which might be considered locally is the implementation of an "excess facilities rate". Under this rate structure, users (or classes of users) are assessed higher charges for water and sewer service whenever use exceeds a predetermined level. Typically, this structure results in higher billings during the peak summer use season, when demands are greatest on the local waterworks system.

Section 3.08: PUBLICITY The declaration of a chronic shortage situation will be preceded and followed by a wide based public relations program, utilizing all communication media, designed to reach all citizens ranging from school children to senior citizens, industries and commercial enterprises.

Section 3.08: PUBLICITY Success of the program will depend on the public information program, as well as on the enforcement procedures and penalties.

ARTICLE 4 - ADMINISTRATION AND ENFORCEMENT

Section 4.01: ADMINISTRATION The administration of this ordinance shall be the responsibility of the _____ Department.

ARTICLE 4 - ADMINISTRATION AND ENFORCEMENT

Section 4.01: ADMINISTRATION Administration of all provisions of this ordinance presumably would require the involvement of more than one local official or local code department. Each municipality should tailor its adopted ordinances to its own needs and organizational structure.

Section 4.02: VARIANCES Variances from the regulatory standards of this ordinance may be granted in accordance with the requirements noted below. No variance shall be granted unless the applicant for the variance can demonstrate that:

Section 4.02: VARIANCES Variances may be granted for the purposes stated and under the conditions specified.

a. an exceptional economic or other hardship would result without the variance;

b. the relief granted is the minimum necessary;

c. there will be no additional threat to public health, welfare or safety or the creation of a nuisance; and

d. no additional public expense will result.

Section 4.03: INTERPRETATION In the interpretation and application of this ordinance, the provisions expressed herein shall be held to be the minimum requirements and shall be liberally construed in favor of the (Village of Greendale) and shall not be deemed a limitation or repeal of any other powers granted by State statutes.

Section 4.04: JUDICIAL APPEALS Any party shall have the right to appeal decisions of the (Village of Greendale) pertaining to this ordinance before the Circuit Court of _____ County.

Section 4.05: SEPARABILITY If any section, clause, provision, or portion of this ordinance is adjudged unconstitutional or invalid by a court of competent jurisdiction, the remainder of this ordinance shall not be affected thereby.

Section 4.06: PENALTIES FOR VIOLATION Violation of the provisions of this ordinance or failure to comply with any of its requirements, including conditions and safeguards established in connection with variances or special use permits shall constitute a misdemeanor. Any person who violates this ordinance, or

Section 4.06: PENALTIES FOR VIOLATION The language here should be tailored so as to be consistent with other ordinancies applicable to misdemeanors.

who fails to comply with any of its requirements, shall upon conviction thereof be fined not more than (_____) dollars or imprisioned for not more than (_____) days, or both, and in addition, shall pay all costs and expenses involved in the case. Each day such violation continues shall be considered a separate offense.

Section 4.07 CORRECTIVE ACTION
Nothing herein contained shall prevent the (Village of Greendale) from taking such other lawful action as is necessary to prevent or remedy any violation. All such costs connected therewith shall accrue to the person or persons responsible.

Section 4.08: EFFECTIVE DATE
This ordinance shall be in full force and effect from and after its passage, approval and publication, as approved by law.

PASSED This ____ day of _____, 19__.

_____
(Clerk)

APPROVED by me this ____ day of _____, 19__.

_____
(President)

ATTESTED and FILED in my office this ____ day of

_____, 19__ in _____.

_____
(Clerk)

APPENDIX.A

ADVICE TO HOMEOWNERS Public education and information programs have been cited repeatedly as being crucial to the success of any municipal water conservation program. Apart from the other ideas conveyed in this report, the following list (prepared by the Small Homes Council-Building Research Council at the University Of Illinois) contains useful water-saving ideas that can be adopted by homeowners. Information on such tips can be conveyed through local newspaper press release, through water billings (if the billing format is adaptable), and through municipal newsletters. Most of these ideas simply involve a change in user habits. While some may be considered extreme by the majority, others will be found quite practical and readily adaptable:

1. Don't use the toilet simply to flush away facial tissues, paper, and other similar solid and liquied wastes (using a wastepaper basket is a lot cheaper).

2. Flush the toilet less often. In most cases, several uses can be made of the toilet for liquid wastes before flushing is required. A deodorant and colorant block in the flush tank or bowl may make this practice aesthetically more acceptable.

3 Take shorter showers. Unless a shower lasts seven minutes or less, bathing in the tub will use less water and will conserve energy. A kitchen timer is a useful bathroom accessory. The "Navy" shower-use water to get wet, turn off water while lathering, turn on water to rinse-uses the least water. The amount of water used in a tub-shower is easily determined by closing the drain during the shower.

4. When filling the tub, don't let water run down the drain until it gets hot. Instead, close the drain before turning on the faucet. The water will soon be hot and the temperature can be adjusted later as the tub fills.

5. Do not let faucets run for washing or rinsing. Always fill a container with water for this purpose or close the drain.

6. Use a brush, wash cloth, or your hand to dilodge particles of dirt when washing anything rather than relying on the force of the water to do the job.

7. Turn off the water while brushing your teeth; this step can save a family 5 to 10 gallons per day (or 3650 gallons a year).

8. Rinse hand razors in the filled sink rather than under running water.

9. When shampooing, turn off the water while lathering the hair.

10. When filling a kettle, try to estimate the exact amount needed; leaving unused boiled water on the stove means that both water and energy have been wasted.

11. Use plastic ice trays which permit the cubes to be loosened by twisting the tray rather than running water over the tray.

12. Keep a bottle of water in the refrigerator rather than letting water run in the sink to get a cool drink.

13. When cleaning vegetables, use a filled sink and a vegetable brush, and wash all the vegetables for a meal at once.

14. Use only the minimum water to cook foods; flavor and food value may be wasted along with water.

15. "Recycle" the water used to cook vegetables by using it in soups to add flavor and nutrients.

16. Do not use garbage disposals except at the end of cooking or clean-up periods or when full. Whenever possible, don't use the disposal at all.

17. Run an automatic dishwasher only with full loads. Do not prewash dishes unless necessary. To save energy, turn the dishwasher off at the start of the dry cycle, open the door, and let the dishes air-dry.

18. Do not use the extra-long prewash and scrub cycles on the dishwasher unless absolutely necessary.

19. Run clothes washers only with a full load unless a reduced fill setting is available. Use "warm" or "cold" settings if possible.

20. Water lawns and gardens in the early morning to avoid evaporation losses.

21. For successful lawn and garden watering, water deeply, and infrequently.

22. Do not allow sprinkler water to flow into a gutter.

23. Avoid sprinklers that produce a fine mist; too much water is lost in wind and evaporation.

24. Use an alarm clock or the stove timer to remind you to shut off the sprinklers.

25. Use pistol-grip nozzles (spring shut-off) on all hoses to avoid waste, and always turn off the faucet tightly when through to prevent leakage.

26. Reduce evaporation losses from flower and vegetable gardens by using an organic mulch or plastic ground cover between rows.

27. Sweep sidewalks and driveways instead of washing them down with the hose.

28. Collect water from roof gutters to use for lawn and plant watering.

29. Do not water lawns or wash cars when water is in short supply.

30. When washing the car, rinse it once, then use a bucket of soapy water to wash it, and then give it one more quick rinse. Taking it to a car wash may save water, since many commercial installations recycle their water.

31. When you go on a vacation, turn off the water to the house; a leak while you are away could be expensive and do a lot of damage. Be sure, however, to turn off the water heater also. If it should begin to leak and drain dry, it could burn out.

32. Insulate the hot water pipes between the heater and the faucets to reduce the amount of water that must be run to get hot water. Smaller hot water piping will have a similar effect.

33. Locate the water heater near the points of most hot water use. Consider a separate water heater for distant bathrooms.

# APPENDIX B

## CONTACTS FOR ADDITIONAL INFORMATION

For more information concerning the specifics of water conservation ordinances and programs, the following individuals have graciously agreed to share their knowledge and experience:

1. Mr. Thomas Borchert, Director of Public Works, Village of Elmhurst.

2. Mr.Kenneth Brewster, Program Coordinator, Lake Michigan Diversion Section, Illinois Division of Water Resources.

3. Mr. Herbert Weeks, Director of Public Works, Village of Mt. Prospect.