THE COMMUNITY ADVISORY BOARD TO THE MASSACHUSETTS WATER RESOURCES AUTHORITY

MWRA ADVISORY BOARD

WASTEWATER NEWS

May 1989, Vol. 1, No. 1 by Marie Goldstein

An Advisory Board newsletter on wastewater issues for cities and towns in the MWRA service area.

The feature article in this first issue of Wastewater News is a history of the MWRA's CSO problem. It is an introduction to this complicated subject and is designed to complement the brief presentation to be given by MWRA staff at the May 11 Advisory Board meeting,* which will be followed by an extensive question-and-answer and discussion period. The CSO problem potentially affects all MWRA rate-payers, so we hope you find the article interesting and informative, and urge you to attend the meeting.

CONTENTS

CSOs--A Brief History and the Authority's Recommended Solution

In December of this year, following an environmental impact review and a public comment period, the MWRA Board of Directors will make its final decision on how to solve the CSO problem in Boston Harbor and its tributary waterways. Sometime before then, possibly in June, the Board will make a crucial policy decision--who will pay. Because that decision may well further escalate rates in the entire MWRA service area, the following history is offered to shed light on a subject about which little is known beyond its most obvious effects.

Last summer Boston area residents became acutely aware of the importance of a healthful environment. Sewage overflows into Boston Harbor have occurred for decades, but during last year's sweltering July and August, the overflows forced the closing of harbor beaches just when they held the only hope of relief. In the public mind, Boston Harbor could not be cleaned up fast enough. But, what most people failed to realize is that the new facilities slated for Deer Island will not end the pollution of the inner

*Centre School, 337 Broadway, Everett, 7:30 p.m.

harbor. The overflow problem is a separate but related issue, and its solution will add considerably to the total clean-up bill.

In October 1986, on the recommendation of Authority staff, the MWRA Board of Directors undertook responsibility for solving the CSO problem. The most compelling reason for doing so was the likelihood--perhaps certainty--that the Court would soon assign this responsibility to the MWRA anyway, and the Authority would have greater control in planning and implementing a CSO control program if it was assumed beforehand. Two practical reasons reinforced the recommendation: the MWRA was the only single entity that could implement a comprehensive program; and planning for it was integral to the overall harbor clean-up program. In agreeing to accept responsibility, the Board also agreed to investigate further "the options for means and methods to equitably allocate costs to member communities" (staff summary, 4/20/88).

What Are CSOs?

In all but four cities in the MWRA service area, stormwater and wastewater, or sanitary sewage, are disposed of through separate systems. Wastewater enters community pipes that connect eventually with the MWRA system, and the flow is then conveyed to Deer Island or Nut Island for treatment. Pipes in the stormwater system either end underground (the stormwater becoming groundwater) or, more often, empty into local bodies of water.

But in Boston, Cambridge, Chelsea, and Somerville, sanitary sewage and stormwater flow through the same pipes, called CSOs, or combined sewer overflows. At some point, these pipes also join the MWRA system. In dry weather, the flow--including wastewater from all the communities upstream--usually gets to the treatment plant intact, although local conditions and equipment malfunctions may, and often do, cause overflows. About 50 times a year during wet weather, when large quantities of stormwater enter a CSO pipe and the flow becomes too much for the treatment plants to handle, a mechanism inside the pipe is triggered, shunting the excess combined waters, with untreated wastes, into the harbor.

Increases in residential population and in business and industry within the entire MWRA service area have increased the amount of wastewater entering the system. Add to this the enormous quantities of water entering the system through infiltration and inflow, plus the lack of permeable surfaces to soak up rainwater in the five CSO communities--all heavily populated, and thus largely concreted, urban centers--and overflows are guaranteed to happen.

CSOs are a problem for a very simple reason--they pollute their "receiving" waters, the water into which they flow. At one time CSOs were an acceptable way to dispose of wastewater-stormwater. In the early years, long before the era of modern treatment plants, CSOs in the Boston area emptied directly into Boston Harbor. But as the population increased, and with it the volume of wastewater, public health considerations dictated that the flow be directed away from the shoreline. In 1884 interceptors were built to collect the combined flow and send it to Moon Island to be discharged there into deeper waters.

Since CSOs are an old solution to the stormwater-wastewater disposal problem, it is not surprising to find them in many of the country's older cities--New York, Philadelphia, the District of Columbia, Chicago, Milwaukee, San Francisco, and Los Angeles. Many of these places, however, tackled the problem long before the MWRA, and are well on their way to solving it.

Earlier Recommendations for Solving the CSO Problem

The Authority today is not breaking new ground in grappling with the CSO problem. A 1936 report suggested treating and controlling overflows at the CSO outlets. Another in 1967 recommended that a deep tunnel be constructed to store the overflow, with its discharge two days later into the ocean.

In 1975 an EMMA (Eastern Massachusetts Metropolitan Area) study considered several solutions and rejected two: the deep tunnel, because the kind of excavating equipment then available would make the project much too costly; and separating the combined sewers, because it meant digging up virtually entire cities. The study instead recommended either storing the overflow locally until the treatment plant could handle it, or treating it minimally in satellite facilities scattered throughout Dorchester Bay, the Charles River Basin, the Neponset River, and the Inner Harbor.

The MDC used the EMMA study to develop its own plan for CSO control. The 57 projects in its 1982 CSO Facilities Plan called for improvements to existing sewers, construction of new storm drains and relief sewers, on-line and off-line storage facilities, and physical treatment or chemical treatment, or both--all of course depending on conditions in the four areas. Some of these projects were undertaken and completed by the MDC, and separation of combined sewers by some of the communities brought the original 108 CSOs down to 84.

MWRA Recommendations

Sometime after the MWRA got under way, the consulting firm CH2M-Hill was asked to reevaluate the 1982 plan to see how viable, if at all, the remaining projects were. Some still are, CH2M-Hill determined, but they suggested that other courses of action be considered. Staff believed that the high costs associated with the deep tunnel option had more or less led to its rejection out of hand. But since new excavating technologies now made the deep tunnel a cost-effective alternative, staff asked the MWRA Board in April 1988 to approve a study of it in depth.

CH2M-Hill also undertook a study of the receiving waters to see what kinds and quantities of pollutants are discharged at various CSOs during heavy rainfalls. That information helped staff determine which technology or technologies they would recommend that the MWRA Board adopt.*

---

*The federal government has not yet issued regulations on either receiving water pollutants or required technologies for stormwater control, but the thinking is that, when the regulations do appear, they will be rigorous, making the capture of overflows mandatory.

In the MWRA Board meeting on November 30, 1988, staff reviewed the process used in evaluating the different CSO control methods and the criteria for identifying those most likely to be successful. Three made the final cut: storage (deep tunnel and near surface); satellite physical-chemical treatment (coarse screening, chlorination, swirl concentrators); and sewer separation.

Staff then divided the entire CSO area into five hydraulically related basins--Upper Mystic River, Lower Mystic River, Charles River, Boston Harbor, and Nepsonset River--and ranked the three alternatives for each, according to capital and O&M costs, the extent of pollution control and reduction; and "implementability" (among others, how much time it would take to develop the technology, how much land would be required for its implementation, whether the technology would be acceptable to the public, and how reliable it would be).

On December 14, 1988, in time to meet the Court milestone of December 31 for preliminary selection of its preferred CSO control program, the Board approved staffs' recommendation of storage, primarily the deep tunnel, but near-surface and surface storage as well. Sewer separation and satellite treatment may be used at some locations on a small scale, but for all practical purposes were ruled out: sewer separation, as being prohibitively expensive and too disruptive to the communities involved; and satellite treatment, because it is neither cost effective nor capable of removing significant amounts of pollutants.

Using the ability of the storage technology to meet water quality criteria as the deciding factor, staff recommended deep tunnel storage for Boston Harbor and the Lower Mystic River area; deep tunnel and near-surface storage for the Charles River Basin and Upper Mystic River areas, with near-surface perhaps being the most cost effective; and near-surface storage for the Neponset River area.

One of the most important criteria from the ratepayers' point of view is obviously cost. The capital cost for this plan, according to a December 6, 1988, Executive Summary, is $653 million in 1988 dollars. Under it, 73 percent of the annual CSO volume and 83 to 90 percent of the average annual pollutant load would be removed by the year 2020. A more extensive deep tunnel, one covering the entire area, would capture 87 percent of the annual CSO volume and 96 percent of the average annual pollutant load, and would cost $795 million in 1988 dollars. If, by the time construction gets under way, costs increase at 6 percent per year, inflation could bring these numbers to over $1.1 billion for the first option and $1.3 billion for the second.

# # #

I/I - Infiltration and Inflow

Infiltration (groundwater that seeps into poorly constructed and deteriorated sewer pipelines) and inflow (primarily rainwater coming into the collection system through illegal connections such as roof leaders and sump pumps) are pervasive throughout community systems, less so in the MWRA system, but a serious problem

everywhere. Many communities are tackling I/I on a continuing basis, and the Authority will soon embark on its own program to reduce excessive infiltration and eliminate illegal inflow. One ofthe Authority's goals is to get the flows down as close as possible to the capacity of both the sewer lines and the existing treatment plants--and the new ones as well--so that fewer basement backups, local overflows of untreated sewage, and combined sewer overflows occur. Another MWRA goal, and one of more than passing interest to ratepayers, is to reduce I/I sufficiently to help keep its operating costs down.

The Authority is concerned about I/I and has good reason to be. DEQE requires the Authority to have an I/I reduction program in place to qualify for construction grants for several relief sewers, and under extreme I/I conditions, can ban sewer connections. More important perhaps, final DEQE approval of construction for the new treatment plants, as well as whatever option is chosen for CSOs, is contingent on the implementation of an effective I/I program.

DEQE, which has statutory powers to administer and enforce a program in the 43 sewer communities aimed at reducing excessive levels of I/I, requires cities and towns to analyze the I/I in their systems and report their findings. The Authority's program will help the cities and towns meet these DEQE-imposed requirements. Though not yet finalized, the program will complement DEQE's work by assuring a coordinated effort.

The Authority will likely provide engineering and technical assistance to the communities as well. An engineering assistance program will help MWRA communities by monitoring their analyses for consistency and making sure the reports are completed on time; a technical assistance program will help communities develop proper maintenance programs for local sewer systems. On the nuts-and-bolts side, the Authority plans to make available to communities--though only on a limited basis--closed circuit television equipment that can be used to identify both illegal connections and structural damage possibly caused by infiltration.

Data derived from various sources--sewer system metering, CASS-type (Computerized Analysis of Sanitary Sewers) models, and studies done by the communities themselves--will be used to estimate I/I flow, determine where the I/I is coming from, and aid in calculating the cost to remove it.* This information will then form the basis for community-specific programs, which should be within the communities' hands within 12 to 18 months. The programs will encompass both schedules and strategies for I/I reduction and will be part of each community's annual sewer use permit.

Other community assistance efforts include:

- o Grant Assistance - help in filing applications for obtaining DEQE I/I Rehabilitation Program grants

---

*This hits at an important aspect of I/I evaluation: I/I is deemed to be excessive if the cost to the Authority to transport and treat it is greater than the community's cost to remove it, or if it can be shown that reductions will result in significant technical, environmental, health, or cost benefits.

- Public Education - mailings to ratepayers, video tapes for use at public showings, and education of municipal and elected officials
- Economic Incentive Program - an evaluation of basing a community's cost for waste treatment services on its actual contribution of sewerage, including flows attributable to I/I, to be obtained in part by data from the Sewer System Metering Project

# # #

Sewer System Metering

The Authority's current method for calculating sewer rates, based in large part on a community's population, is a clearly imperfect system, since the estimated flow the community is charged for may be at wide variance with the amount of wastewater actually generated. Lacking actual usage data, a community has little reason to reduce its flow either by encouraging water conservation or reducing excessive I/I. But backed by a section of the Enabling Act that requires the MWRA to "provide for the abatement, reduction and prevention of inflow and infiltration into the sewer system" by the "installation and maintenance of meters," the Authority is taking steps to create such an incentive through its Sewer System Metering Project. One goal of the program is to provide flow-based data for a future analysis of the current rate structure.

Since total systemwide metering of the 1,750 local sewer connections into the MWRA system is much too costly for the Authority to undertake, only about 150 meters will be installed at various locations throughout the 43 sewer communities. The Authority anticipates, however, that more than 80 percent of the flow in each community will be measured.

Recently, the Authority received $594,350, or 90 percent of the cost of the program's first two phases: Step 1 - planning; and Step 2 - design of the program. In addition, the Authority has applied for an additional $6.5 million for the construction phase.

# # #

Future issues of Wastewater News will feature articles on the new treatment plants and related facilities, relief sewer projects, fast-track improvements at Deer Island, and anything else that we think might be of interest to you. We would appreciate knowing what you would like to see in the newsletter, so please let us hear from you. As one of our regular features, we would like to pass along tips on how communities have solved wastewater problems, so if you have any successes you want to share, or any stories to tell, let us know.