

Summary Report of MWRA Demand Management Program Fiscal Year 2009

This report is organized into four sections, as follows:

1. Summary
2. Background and Long Range Water Supply Program
3. Ongoing Demand Management Programs and Detailed Activities during Fiscal Year 2009
4. Demand Management Plans for Fiscal Year 2010

1. Summary

This report has been prepared to meet the requirements of the Massachusetts Water Resources Authority's (MWRA) NPDES Permit MA0103284 - Part I, Item 10.c (page 14 of 32). The purpose of the demand management section (including water conservation) in MWRA's NPDES permit is to help maintain the dry day wastewater flow to the Deer Island Wastewater Treatment Plant below the 436 million gallons per day (mgd) permit limit. MWRA's wastewater flow is derived from three flow components: sanitary flow, groundwater infiltration, and stormwater inflow. The demand management program will help reduce the sanitary component of wastewater flow as well as provide benefits to the water system and source watersheds. Information on reduction of infiltration and inflow is provided in the MWRA Annual Infiltration and Inflow Reduction Report for Fiscal Year 2009 (submitted under separate cover letter).

MWRA has maintained the 365 calendar day running average dry day wastewater flow well below the 436 mgd limit and well below the 415 mgd trigger (see NPDES Permit Part I, Item 10.a and 10.b). For fiscal year 2009 (ending June 30, 2009), the 365-calendar day running average dry day flow to the Deer Island Wastewater Treatment Plant was 310.0 mgd; dry day flow has averaged about 319 mgd over the last ten years (see Table 1). The dry day flow is reported monthly by MWRA as part of the NPDES Operational Performance Summary.

Table 1 – History of 365-Calendar Day Running Average Dry Day Wastewater Flow

Fiscal Year	Running dry day flow (mgd)
2000	323.8
2001	323.5
2002	293.5
2003	330.4
2004	320.9
2005	344.5
2006	323.1
2007	331.8
2008	286.2
2009	310.0
Ten Year Average	319

MWRA continues to implement effective water demand management policies and programs for the MWRA-owned distribution system, as well as member community-owned distribution systems. The following bullets provide an overview of actions take during FY09. Background information and details on each program are provided in other sections of this report.

- Leak detection survey of 263 miles of MWRA distribution main and subsequent leak repairs, saving approximately 0.41 mgd of water;
- Leak detection survey of 4,545 miles of member community distribution main in 32 communities, and subsequent leak repairs, saving approximately 5.8 mgd of water;
- \$23 million in interest-free loans to fund 18 local community water pipeline rehabilitation projects, providing 15 miles of new water main and 12 miles of cleaned and lined water main;
- Distribution of over 24,000 water saving fixtures (low-flow showerheads and faucet aerators), installation instructions and leak detection tablets are distributed with the low-flow fixtures;
- Distribution of approximately 150,000 pieces of water conservation literature; and
- 325 classroom presentations reaching approximately 8,600 students in the service area.

The continued effectiveness of MWRA’s conservation efforts over the past year is demonstrated by the fact that baseline water demand (water withdrawal from MWRA reservoirs) continues to remain stable or decline and is comfortably below the system’s safe yield of 300 mgd, see Figure 1.

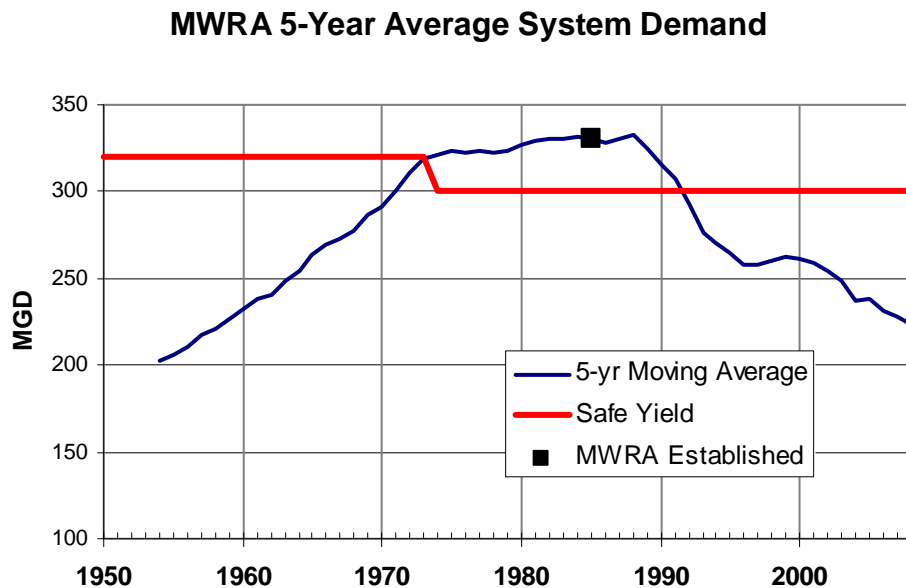


Figure 1 – MWRA Reservoir Withdrawals

For calendar year 2008, water demand was 206 mgd. Table 2 provides data on water use and wastewater generation over the most recent ten-year period (calendar year data). The data on “water demand” represents total water withdrawals from MWRA reservoirs. The data on “wholesale water sales” represents water sold by MWRA to all 50 fully and partially supplied communities (a population of about 2.3 million). “Total wastewater generation” data represents the total flow to the Deer Island Treatment Facility from all 43-member sewer communities (a sewered population of about 2.0 million). The “dry day wastewater generation” data represents flow to the Deer Island Treatment Facility during only dry days as defined in MWRA’s NPDES Permit.

Table 2 – MWRA Total Water Demand and Wastewater Generation

Calendar Year	Water Demand (Withdrawals)	Wholesale Water Sales	Total Wastewater Generation	Dry Day Wastewater Generation
1999	276 mgd *	245 mgd*	344 mgd	307 mgd
2000	252 mgd *	229 mgd*	362 mgd	331 mgd
2001	247 mgd *	229 mgd*	346 mgd	305 mgd
2002	237 mgd	219 mgd	340 mgd	309 mgd
2003	222 mgd**	214 mgd	382 mgd	333 mgd
2004	216 mgd**	208 mgd	356 mgd	327 mgd
2005	225 mgd**	213 mgd	403 mgd	342 mgd
2006	212 mgd	201 mgd	380 mgd	322 mgd
2007	220 mgd	209 mgd	330 mgd	300 mgd
2008	206 mgd	200 mgd	380 mgd	317 mgd
10 Year Average	231 mgd	217 mgd	362 mgd	319 mgd

* Total withdrawals and water sales included an additional (temporary) demand from Cambridge while it rebuilt its own water treatment plant. For calendar year 1999, 15 mgd; calendar year 2000, 14 mgd; and calendar year 2001, 6 mgd. ** Total withdrawals do not include an additional demand associated with Carroll Water Treatment Plant start up and testing activities. For calendar year 2003, 2,710 MG (annual average 7.4 mgd); calendar year 2004, 1,326 MG (annual average 3.6 mgd); calendar year 2005, 12,264 MG (annual average 33.6 mgd).

Considerable additional data on MWRA demand management and water conservation programs can be found on MWRA’s website at www.mwra.com.

2. Background and Long Range Water Supply Program

The MWRA, an independent public authority, was established through legislation in 1985 to provide wholesale water and sewer services to 2.5 million people in 61 cities and towns. Some of the Authority’s goals, purposes and objectives relate directly to water demand management efforts, including:

- Efficient and economical operation of water delivery;
- Programs for leak detection for member communities; and,
- Repair, replacement, rehabilitation, modernization and extension of the delivery of water within the service area of the Authority.

From its inception, MWRA has made demand management/water conservation a high priority. In 1985, MWRA inherited a water system that had been exceeding its safe yield of 300 mgd for almost twenty years. In response to increasing water demand during the 60s, 70s and 80s, several water supply studies were undertaken by MWRA's predecessor agency, the Metropolitan District Commission (MDC). These studies, collectively called the Long Range Water Supply Study-EIR 2020, projected the need for 70 mgd of additional supply by 2020 above a base demand of 340 mgd. The studies identified a series of supply development options including diversion of a portion of the Connecticut River flow. Demand management options were also examined. In 1986, the MWRA Board of Directors, through a series of water policy decisions, opted to aggressively pursue demand management strategies rather than pursue options for increasing water supply. This commitment to demand management resulted in the implementation of a highly successful water conservation program that has been a role model for water conservation efforts both nationally and globally.

Long Range Water Supply Program

Following the commitment by the Board of Directors in 1986 to demand management, MWRA in 1987 developed and launched its Long Range Water Supply Program (LRWSP). The LRWSP included 30 different recommendations to be completed over the next decade at a cost of tens of millions of dollars. The demand management components of the LRWSP were meant to reduce water use and water losses throughout the service area. During a three-year trial program from 1987-1989, MWRA, along with its member communities, initiated demand management efforts that reduced average demand from 326 mgd in 1987 to 285 mgd in 1990 (see Figure 1). This reduction put average demand below the water system's safe yield of 300 mgd for the first time in over 20 years. With this success, the demand management components of the LRWSP were continued beyond the trial program. A detailed discussion of the demand management activities developed from the LRWSP, covering the 1991 through 2000 period, was provided in the Fiscal Year 2000 MWRA Demand Management Report (available at www.mwra.state.ma.us/harbor/enquad/pdf/ms-061.pdf).

Drought Management Plan

In addition to long range planning, the need for a short term drought management plan was made clear after two years of below average precipitation and overuse of the Quabbin-Ware-Wachusett system led to a potential drought warning in the 1988-1989 period. The MWRA Drought Management Plan was submitted to the Massachusetts Department of Environmental Protection in 1989. Shortly thereafter, precipitation returned to normal and the reservoirs rose back to normal. In spring 2000, MWRA was involved in the Massachusetts Drought Management Task Force's development of a state drought response plan. The plan outlines agency responsibilities during drought and sets drought stage triggers based on hydrologic conditions. The plan is regionally flexible; for example, small water systems may need water use restrictions during a short-term drought while the MWRA service area would avoid restrictions due to the large storage volumes in Wachusett and Quabbin Reservoirs. Only a long-term drought more severe than the 1960's drought of record would lead to restrictions in the MWRA service area. The plan also retains responsibilities for MWRA's direct lines of communication with member communities and customers during a drought.

3. Ongoing MWRA Demand Management Programs and Activities During Fiscal Year 2009

Planning and Policies

In January 2007, MWRA completed an updated Water System Master Plan which is intended to serve as the framework for annual capital planning and budgeting decisions. As part of this effort, staff documented supply and demand characteristics of the system to confirm that the 300 mgd safe yield of the MWRA water system is sufficient to meet future demand for water both within the service area and additional demand outside the service area as may be approved. Staff used the following conservative demand planning scenario to arrive at this conclusion: continuation of current base demand in the existing MWRA service area (230 mgd, based on 5-year average demand in FY2004); projected increased demand from population and employment growth through 2030 within the existing MWRA service area (13 mgd); approximately 5 mgd from new communities that were actively pursuing admission or increased withdrawals from MWRA in 2007; an allowance for the potential additional demand for MWRA water from partially served communities (planning assumption is up to 18 mgd); and potential additional demand for MWRA water from as many as 22 communities not currently or actively pursuing MWRA admission but within proximity to the service area and that may have or face future water deficits (up to 10 mgd). The conservative planning scenario represents a potential future demand of 276 mgd, well below the system safe yield of 300 mgd.

MWRA has adopted Policies that establish stringent controls and a rigorous approval process for entities seeking admission to the MWRA water system or to use MWRA water on an emergency basis. These policies include:

- **OP.05, Emergency Water Supply Withdrawals.** This policy applies to communities outside MWRA's water service area that are seeking water on an emergency basis. The MWRA may approve emergency withdrawals for no more than six months at a time.
- **OP.09, Water Connections Serving Property Partially Located in a Non-MWRA Community,** also referred to as the "Water Straddle" policy. This policy applies to all parties seeking to obtain water for a location, building, or structure situated entirely outside the MWRA water service area but located on a parcel of land, under single ownership, and which is subject to an integrated plan for use or development, that is partly inside the MWRA's water service area.
- **OP.10, Admission of New Community to MWRA Water System.** This policy applies to communities seeking admission to the MWRA water system, and to state, county, institutional, and federal facilities seeking MWRA water for a location outside MWRA's water service area, as defined in MWRA's Enabling Act.

Demand management is also an important component of regulations for MWRA's Continuation of Contract Water Supply (360 CMR 11.00) that is applicable to 25 communities that purchase water from the Authority under a cooperative contract basis. In addition, all communities that purchase water from MWRA are required to complete a leak detection survey and perform follow-up leak repairs of their entire distribution system at least once every two years (360 CMR 12.00).

MWRA Capital Projects from the Water Master Plan

Total water system needs identified for the FY07- 48 Master Plan timeframe are approximately \$1.1 billion (in 2007 dollars). All of the projects identified in the Master Plan were prioritized. The prioritized list is used to develop the MWRA's Capital Improvement Program (CIP) which is updated annually.

Leak Detection and Repair of MWRA Distribution System

The MWRA annual leak detection and repair program (initially established during 1988 to 1990) is performed by MWRA personnel. All MWRA water distribution pipes (284 miles) are surveyed on a regular maintenance schedule for leaks with repairs made promptly. During FY09, a total of 263.3 miles of MWRA-owned distribution main were surveyed for leaks. A total of 7 leaks were detected and repaired, accounting for approximately 0.41 mgd of water savings. Table 3 shows the history of the last ten years of leak detection on MWRA distribution system.

Table 3 – Leak Detection on MWRA Distribution System

Period	Miles Surveyed	Number of leaks	Estimated leakage-mgd
FY00	260	17	0.4
FY01	267	13	0.5
FY02	257	13	0.5
FY03	230	26	1.0
FY04	184	16	0.5
FY05	227	19	0.6
FY06	270	10	0.6
FY07	258	16	0.4
FY08	272	3	0.2
FY09	263	7	0.4
10 Year Average	249	14	0.5

Leak Detection and Repair of Member Community Distribution Systems

To help communities identify leaks in their local distribution systems, a program providing a free one-time leak detection survey was established during 1988 to 1990. Based on the success of the initial program, MWRA developed leak detection regulations (360 CMR 12.00) that went into effect in July 1991. Communities that purchase water from MWRA are required to complete a leak detection survey of their entire distribution system at least once every two years. Communities can accomplish the survey in one of three ways: (1) using their own crews, (2) hiring their own contractor, or (3) using MWRA's task order leak detection services contract. Leak detection/repair work is generally cost effective as the value of the saved water often far exceeds the cost of the leak detection/repair work. During FY09, a total of 4,545 miles of local water pipeline were surveyed for leaks. A total of 529 leaks were detected and repaired in 32 community distribution systems,

accounting for 5.8 mgd of water savings. Table 4 shows the history of the last eighteen years of leak detection on community pipes.

Table 4 - Leak Detection on Community Pipes

Period	Miles Surveyed	Number of leaks	Estimated leakage-mgd
FY92 & FY93	6227	1988	24.8
FY94 & FY95	5924	1134	14.1
FY96 & FY97	6013	1527	17.8
FY98 & FY99	5924	1257	12.4
FY00 & FY01	6650	928	9.3
FY02 & FY03	6198	1032	8.6
FY04 & FY05	6753	968	13.2
FY06 & FY07	6871	833	8.5
FY08 & FY09	7879	987	10.8
18 Year Average	3247	592	6.6

Rehabilitation and Replacement of Member Community Distribution Systems

MWRA implemented the pilot Water Infrastructure Rehabilitation Financial Assistance Program in 1997-1999. This program provided \$30 million in 25 percent grants and 75 percent interest-free loans to member water communities for water system rehabilitation projects. Local projects implemented through this program resulted in the replacement of over 22,000 water meters and rehabilitation or replacement of over 80 miles of distribution pipeline. Water loss from both pipeline and valve leakage was reduced.

In November 1999, MWRA approved the \$256 million Local Pipeline Assistance Program (LPAP) established with the primary objective of improving water quality in community-owned distribution systems. This interest-free loan program primarily funds replacement and/or cleaning/lining of unlined watermains. A secondary benefit of the program is the reduction of water pipeline leakage. Quarterly funding distribution under the Local Pipeline Assistance Program began in August 2000 (FY01). Through nine years of the program, \$163 million has been distributed to thirty communities to fund 194 local projects. These projects have provided for a total of 150 miles of new lined water pipe and 98 miles of cleaning and lining of existing water pipe. Table 5 shows the history of the Pilot and Local Pipeline Assistance Programs.

Table 5 – Summary of Pilot and LPAP Programs

Period	\$ Distributed	Projects Funded	Miles of New Pipe	Miles of Rehabilitated Pipe
FY98/99	\$30 million	85	42	39
FY01	\$17 million	32	18	22
FY02	\$16 million	19	22	6
FY03	\$16 million	18	16	9
FY04	\$19 million	22	24	4
FY05	\$20 million	24	17	15
FY06	\$17 million	17	7	4
FY07	\$26 million	25	18	14
FY08	\$10 million	19	13	12
FY09	\$23 million	18	15	12
TOTAL	\$193 million	279	192	137

Water Metering and Monitoring

Continued annual routine calibration and maintenance of the revenue meters allows MWRA to track water use and accurately charge its wholesale customer communities. MWRA analyzes nighttime low flow data and historical trends from the revenue meters to help member communities identify potential water leakage in local systems. During FY09, MWRA continued its ongoing program for operation and maintenance of the water metering system. All meters received routine calibration on a regular schedule.

Residential and Municipal Water Conservation

MWRA continues to provide low-flow device kits to member communities, housing authorities, development corporations, and individual retail customers at no cost. The low-flow device kits include: 2.0 gallon per minute (gpm) showerheads, 1.5 gpm bathroom faucet aerators, 2.2 gpm kitchen faucet aerators, fixture installation instructions, and leak detection dye tablets. MWRA also maintains its water conservation hotline (617-242-SAVE). During FY09, a total of 24,339 water saving fixtures (8,551 showerheads, 15,848 faucet aerators) were distributed to MWRA households and member community water departments.

To expand its community-based water conservation programs during calendar year 2008, MWRA received a \$65,000 grant from MassDEP Bureau of Resource Protection. The grant funds allowed MWRA to expand its 2008 water conservation outreach and education program for member communities with the implementation of two additional local projects to further promote drinking water conservation and reduce water usage. The two grant funded projects were: 1) Low-Flow Toilet Retrofit Rebates, and 2) Pilot Community Water Audits. The Summary Report has been submitted to MassDEP and has been shared with member communities and other regional stakeholders as a water conservation educational tool. The Report is on-line at <http://www.mwra.com/comsupport/pilotprograms/0509depfinalreport.pdf>.

The Low-Flow Toilet Retrofit Rebate project was developed to provide a direct incentive for local communities to purchase/install low-flow (1.6 gallon per flush or less) toilets or toilet flush valves in municipal buildings to replace less efficient toilets that use a larger water volume per flush. For each eligible toilet retrofit, the community received a \$100 rebate from MWRA. The project was a success with a total of 351 low-flow toilet retrofits being installed in ten separate communities. A total of \$35,100 in reimbursement funds (351 rebates of \$100 each) were distributed to the ten local communities under the project. The Pilot Water Audit project was developed to promote the benefits of municipal water audits and help identify water system improvements to minimize non-billed and unaccounted-for-water. Two community water audits were conducted to balance the volume of water purchased from MWRA (wholesale purchase) with the volume billed (retail sales) and account for the remainder of non-billed water volume.

Some of the lessons learned that are detailed within the Summary Report are:

- MWRA's relatively low-cost community water conservation outreach and education program (budgeted at \$25,000 annually) provides significant water conservation and water/sewer charge reductions for retail water customers in the MWRA service area. In addition, more aggressive marketing of the outreach campaign for 2008 resulted in double the requests for free water conservation educational materials and low-flow device kits from member communities and individual customers.
- Rebates of \$100 proved to be an effective direct incentive to encourage low-flow toilet retrofit projects to be implemented in municipal buildings and public housing units. Through implementation of the project, MWRA learned that most municipal buildings have been retrofitted with low-flow toilets (only 22 percent of the rebates went to municipal buildings). However, a significant need still exists with public housing authorities (housing authority's utilized 78 percent of the rebate funds).
- Low-flow toilet installation costs (about \$500 each) would be recouped in about 4 years based on water use savings from average retail water and sewer fees. For water customers that do not pay sewer fees (homes with septic systems), the low-flow toilet installation cost would be recouped in about 10 years.
- US EPA's WaterSense website (www.epa.gov/watersense/) is an excellent source of information on WaterSense labeled products (manufacturers, models, etc.) that meet the EPA's criteria for water efficiency, quality, and product performance.
- Municipal water audits can be a valuable tool to help local communities identify water system improvements to minimize non-billed and unaccounted-for-water.
- Costs associated with a comprehensive meter replacement and automated meter reading project may be offset in 5 to 10 years from increased retail water and sewer fees from prior under-registration of old meters.

Public Education Outreach

MWRA continues to provide public education material to communities and individual customers at no cost. Member communities are encouraged to distribute the water conservation information to retail customers. The primary information targeted for retail customers is indoor and outdoor water conservation brochures printed/folded to be used by member communities as bill inserts. MWRA also provides the brochures directly to retail customers, watershed associations, environmental groups, etc. to fulfill e-mail and telephone requests.

During FY09, MWRA sent letters and follow-up e-mails to all water and sewer member communities highlighting the Authority's bill insert educational brochures on indoor and outdoor water conservation, and outlining the availability (at no cost) of the water conservation kits. Fifty percent of the member communities took advantage of this offer. In all, approximately 150,000 pieces of printed materials were distributed.

During FY09, MWRA continued its participation in the US EPA WaterSense program to help consumers save water for future generations and reduce costs on their utility bills. WaterSense aims to decrease indoor and outdoor water use through water-efficient products and simple water-saving practices. The program encourages customers to look for WaterSense labeled products, which have been independently certified for efficiency and performance, and promotes water-saving techniques that reduce stress on water systems and the environment.

During FY09, MWRA continued to include water conservation information in the Annual Drinking Water Quality Report. This report is mailed to every household in the MWRA service area, a distribution of more than 800,000. The Annual Water Quality Report also carries the EPA WaterSense Partner logo.

School Education

MWRA continues to promote water conservation awareness for young people. The ongoing School Education program is designed to provide a science-based curriculum using a four step process: educational curriculum development, conducting classroom presentations, wide-spread teacher training and continual follow-up, and support to educators. Educational materials have been designed for students from the elementary level to the high school level. During the FY09 (2008/2009) school year, MWRA's School Educational outreach program (including water conservation information) made 325 classroom presentations reaching approximately 8,600 students in pre-kindergarten through college level classes in 40 communities including Allston, Brighton, East Boston South Boston, Dorchester, Charlestown, Jamaica Plain, Roslindale, and Roxbury. In addition to classroom presentations, the MWRA again held a Poster/Writing Contest. More than 1,550 posters and writing entries were submitted. The poster contest topic for all three writing categories (grades K-2; grades 3-5 and grades 6-8) was proper disposal of household hazardous waste and greener alternatives.

Industrial, Commercial, and Institutional Audits and New Technologies

MWRA has found that conservation initiatives for industrial, commercial, and institutional water users are widely available through private consulting firms. MWRA has developed and offers at no cost a 52-page Guide to Water Management that contains detailed information to help local facility managers reduce overall water use. In addition, detailed fact sheets on industrial, commercial, and institutional water users are available on MWRA's web site at <http://www.mwra.com/04water/html/indust.htm>. These include specifics on hospitals, schools, colleges and athletic facilities; restaurants; and commercial buildings.

Water Supply Citizens Advisory Committee

MWRA's 1986 decision to aggressively pursue water conservation rather than look for additional sources of water was strongly advocated by the Water Supply Citizens Advisory Committee (WSCAC). This unique citizen's group was formed in 1977 to review a proposed Connecticut River diversion plan to supply water to the metropolitan Boston area. From its beginning, the group has been a strong supporter of water conservation measures and helped formulate the water conservation language in MWRA's Enabling Act legislation. In 1986, WSCAC encouraged MWRA to pursue demand management rather than look for new water supplies. During the late 1980's and early 1990's, the citizen's group promoted trigger and drought management planning. With its long commitment to the water supply system, WSCAC continues to provide independent citizen input on MWRA's policies and programs, while voicing public support of source protection and conservation. During FY09, the Water Supply Citizens Advisory Committee has continued to strongly support MWRA's water conservation efforts. The committee has been active providing review and input on water system expansion issues. A one-year contract for continuation of WSCAC was authorized by the MWRA Board of Directors on June 24, 2009.

Other Activities

In addition to the activities outlined above, MWRA staff provided assistance to outside agencies in the area of water conservation. In celebration of Earth Day, MWRA provided water conservation fixtures and literature for EPA's Green Expo, MassDEP's "Green Team", and Needham Technology Center's celebration. Assistance was provided to the Springfield Water and Sewer Commission to develop a water conservation program. Also, staff provided water conservation fixtures and literature to promote water conservation for: Roots & Shoots of the Jane Goodall Institute, Mass Municipal Association annual meeting and trade show, Winchester's Eco-Festival, Boston's Green Festival, Ventura Foods, Green Marlborough, and Dorchester's Beach Festival.

4. Demand Management Plans for Fiscal Year 2010

During FY10, MWRA plans to continue its demand management efforts at a similar level as FY09. The Authority's long-range planning, leak detection, system rehabilitation, water conservation and educational outreach programs have long been established as essential components of demand management. MWRA's Community Support Program will continue to work with both water and sewer member communities to foster water conservation activities and help minimize wastewater flow.

Beginning in FY09 and continuing through FY10, MWRA is implementing a \$100,000 project to install low-flow toilet retrofits in municipal buildings and local housing authority properties. Grants are being provided by MWRA as reimbursement of 100 percent of the eligible cost (including materials and contracted installation expenses) to retrofit low-flow toilets and/or flush valves up to a maximum of \$1,000 per existing high-flow toilet. This project is being undertaken in connection with the settlement of an enforcement action, *United States v. Massachusetts Water Resources Authority*, taken on behalf of the U.S. Environmental Protection Agency under the Clean Water Act.