



# Appendices

## APPENDIX A

### DIRECT EXPENSES BUDGET LINE ITEM DESCRIPTIONS

MWRA's direct expenses budget funds the annual expenses of its operating and support divisions. Though the direct expenses budget is approximately 31% of MWRA's total budget, it is these expenses which directly support the provision of water and sewer services to MWRA's customers. The direct expense budget includes the annual costs of operating the water and sewer systems, and funds the policy direction, administrative, financial, and legal support services for MWRA's ongoing operations. The direct expenses budget also includes the personnel costs for management and oversight of MWRA's extensive capital programs.

There are 11 line items in the division budgets. The line items are:

**Wages and Salaries** - This line item includes funds for regular pay, shift differential, holiday pay, and standby pay for MWRA staff, as well as funds for interns and temporary staff.

**Overtime** - This line item includes funds for overtime related to operations, maintenance, emergencies, and training.

**Fringe Benefits** - This line item includes funds for health and dental insurance, unemployment compensation, Medicare, overtime meals, and tuition reimbursement.

**Workers' Compensation** - This line item includes funds for compensation payments, medical payments, and settlements of compensation claims.

**Chemicals** - This line item includes funds for the chemicals used in water and wastewater treatment, such as sodium hypochlorite, soda ash, sodium bisulfite, and hydrofluosilicic acid.

**Utilities** - This line item includes funds for electricity, diesel fuel, natural gas and other utilities such as water and sewer services paid by MWRA to the towns in which it operates facilities.

**Maintenance** - This line item includes funds to purchase materials and services for the maintenance of MWRA's plants and machinery, water and sewer pipelines, grounds, and buildings.

**Training and Meetings** - This line item covers the costs of staff training, meetings, and professional seminars.

**Professional Services** - This line item funds outside consultants supporting MWRA activities, including engineering and construction services, laboratory and testing contracts, computer system consultants, and legal and audit services.

**Other Materials** - This line item includes funds for office materials, equipment, postage, laboratory supplies, MWRA vehicles, work clothes, and computer hardware and software.

**Other Services** - This line item includes funds for space leasing, health and safety initiatives, removal of grit and screenings from the sewerage system, and the contracted operation of MWRA's residuals processing plant.

<b>FY19 Final Current Expense Budget</b>						
<b>MWRA Direct Expenses by Line Item</b>						
LINE ITEM	FY16	FY17	FY18	FY19	Change	
	Actuals	Actuals	Final Budget	Final Budget	FY19 to FY18	
WAGES & SALARIES	\$ 96,118,427	\$ 98,494,291	\$ 104,286,371	\$ 107,032,021	\$ 2,745,650	2.6%
OVERTIME	4,355,586	4,951,621	4,110,637	4,447,555	336,918	7.6%
FRINGE BENEFITS	19,131,139	19,623,635	20,997,975	21,173,571	175,596	0.8%
WORKERS' COMPENSATION	2,350,369	2,565,336	2,322,980	2,422,609	99,629	4.1%
CHEMICALS	9,297,550	9,262,849	9,836,932	10,830,453	993,520	9.2%
UTILITIES	18,744,867	20,249,594	21,735,224	22,868,632	1,133,408	5.0%
ONGOING MAINTENANCE	30,978,045	30,798,709	32,200,785	32,258,726	57,941	0.2%
TRAINING & MEETINGS	370,752	360,115	406,269	455,770	49,501	10.9%
PROFESSIONAL SERVICES	5,886,715	6,698,861	7,221,622	7,675,976	454,354	5.9%
OTHER MATERIALS	6,186,216	5,851,449	6,692,659	7,381,099	688,440	9.3%
OTHER SERVICES	22,628,385	21,865,445	22,764,526	23,065,412	300,886	1.3%
<b>TOTAL</b>	<b>\$ 216,048,051</b>	<b>\$ 220,721,904</b>	<b>\$ 232,575,980</b>	<b>\$ 239,611,824</b>	<b>\$ 7,035,844</b>	<b>3.0%</b>

<b>FY19 Final Current Expense Budget</b>						
<b>MWRA Direct Expenses by Division</b>						
DIVISION	FY16	FY17	FY18	FY19	Change	
	Actuals	Actuals	Final Budget	Final Budget	FY19 to FY18	
EXECUTIVE	\$ 6,748,473	\$ 6,706,254	\$ 7,481,735	\$ 7,590,300	\$ 108,565	1.4%
OPERATIONS	160,119,301	162,910,111	170,234,435	176,153,628	5,919,192	3.4%
LAW	2,044,933	2,285,192	2,306,866	2,059,794	(247,072)	-12.0%
ADMINISTRATION	43,217,254	44,967,226	48,426,600	49,486,446	1,059,846	2.1%
FINANCE	3,918,090	3,853,121	4,126,344	4,321,656	195,312	4.5%
<b>TOTAL</b>	<b>\$ 216,048,051</b>	<b>\$ 220,721,904</b>	<b>\$ 232,575,980</b>	<b>\$ 239,611,824</b>	<b>\$ 7,035,844</b>	<b>3.1%</b>

Performance measures for all MWRA Divisions and Departments are published monthly in the MWRA “Yellow Notebook” and quarterly in the MWRA “Orange Notebook.” In addition, monthly financial staff summaries are presented to the Board of Directors reviewing monthly budget performance and explaining variances. All documents are available on-line at [mwra.com](http://mwra.com).

**APPENDIX B  
BUDGET PROCESS AND TIMETABLE**

MWRA operates on a fiscal year that starts July 1. The budget development process begins in August and, as described below, continues through a series of interactive reviews and revisions until June, when the Board of Directors approves the final budget. Throughout the formal budget process, MWRA staff maintains an ongoing dialogue with the Board of Directors and Advisory Board to discuss issues, the status of budget development, and other concerns.

	Current Expense Budget (CEB)	Capital Improvement Program (CIP)
Date	Activity	Activity
8/14/17	Prepare budget guidelines and materials	Update database with annual estimated inflation factor
9/14/17		Kick-off meeting
9/25/17	Kick-off meeting - Release database files to all departments	
10/27/17		Project Managers update project schedules and costs
10/30/17		Proposed CIP finalized
11/6/17	Budget staff prepare capital financing requirements and indirect expenses	Review of Proposed CIP with senior management
11/13/17	Update CEB impacts from CIP	
11/20/17		Proposed CIP Staff Summary and Board of Directors presentation
12/1/17	Proposed CEB, Rate Revenue Requirement and planning projections	
12/15/17	Review of Proposed CEB with Senior Management	
12/20/17		Present Proposed CIP at Board Of Directors Meeting
12/21/17		Advisory Board Review and Comments begins
1/15/18	Proposed CEB Staff Summary and Board of Directors presentation	
2/21/18	Present Proposed CEB at Board of Directors Meeting	
2/22/18	Advisory Board Review and Comments begins	
3/15/18	Spring Revisit - Distribute Proposed FY19 database files to all departments	
4/9/18	Update Proposed CEB	Update Proposed CIP
4/15/18	Public hearings	Public hearings
4/27/18	Receive Advisory Board Comments	Receive Advisory Board Comments
5/18/18	Prepare MWRA's response to Advisory Board Comments	Prepare MWRA's response to Advisory Board Comments
5/18/18	Prepare Draft Final CEB presentation for Board of Directors	Prepare Draft Final CIP presentation for Board of Directors
5/30/18	Presentation - Draft Final CEB to Board of Directors	Presentation - Draft Final CIP to Board of Directors
6/15/18	Draft Final CEB Staff Summary	Draft Final CIP Staff Summary
6/20/18	Board of Directors Meeting - Vote on Final CEB	Board of Directors Meeting - Vote on Final CIP



## APPENDIX C

### **MASSACHUSETTS WATER RESOURCES AUTHORITY BUDGET AND ASSESSMENT POLICIES AND PROCEDURES**

**(Revised August 2003 to incorporate changes to capital budget section of Management Policies adopted by the Board of Directors June 11, 2003)**

These policies and procedures govern certain budget, assessment, and rates management practices at the Massachusetts Water Resources Authority (MWRA). Policies and procedures may be amended from time to time, provided that changes in provisions governing reporting to or approvals by the Board of Directors or the Advisory Board must be approved by the Board of Directors. If any sections of these policies and procedures are at variance with requirements of MWRA's financing agreements, the latter shall govern.

#### ASSESSMENT POLICIES AND PROCEDURES

##### **Basis of MWRA Assessments**

MWRA is required by its Enabling Act to establish assessments which, with other revenues, provide sufficient funds each year to pay all current expenses, debt service, and obligations to the Commonwealth; to pay all costs of maintenance, replacement, improvements, extension, and enlargement of the sewer and waterworks systems; to create and maintain reserve funds; and to provide amounts required by financing agreements. These assessments are adopted by MWRA based on the rate revenue requirements set forth in the Current Expense Budget.

##### **Costs Recovered**

MWRA capitalizes certain of its asset costs in accordance with its capitalization policy. Capital expenditures are planned as set forth in the Capital Improvement Program and are recovered through assessments in accordance with MWRA financing agreements. The Current Expense Budget provides detailed information on capital and debt costs, additions to reserves, and all operations and maintenance costs to be recovered with current revenue.

##### **Sources of Current Revenue**

MWRA recovers most of its current expenses from users of the services it provides. In addition to rate revenue requirements, budgeted current revenue includes anticipated fines, fees, investment income on certain fund balances, and payments for contracted services. MWRA is committed to seeking additional sources of current revenue.

##### **Coverage Requirements**

MWRA's financing agreements include coverage requirements which provide that each year revenue less operating expenses (net revenue) must be more than the amount required for debt service payments on outstanding bonds. The primary bond coverage requirement is that net revenue must be 120 percent of required debt service fund deposits for bonds outstanding excluding subordinated bonds. The secondary coverage requirement is that net revenue must be

110 percent of required debt service fund deposits for all bonds outstanding, including subordinated bonds. Revenue must be raised annually to meet the primary and secondary bond coverage requirements and may be used for additions to reserves or for payment of obligations to the Commonwealth. Amounts remaining after these uses are used to pay capital costs in order to reduce the need for future borrowing or to reduce current debt service costs. In addition, MWRA has a supplemental bond coverage requirement that amounts contained in its Community Obligation and Revenue Enhancement (CORE) Fund shall equal 10 percent of required debt service fund deposits for bonds outstanding, excluding subordinated bonds. Amounts required to be on deposit in the CORE Fund are recovered through assessments as necessary.

### **Basis of Budgeting**

The Authority is required by the Enabling Act to establish user rates for its water and sewer services which provide sufficient funds to recover the costs of operations (excluding depreciation), debt service, maintenance, replacements, improvements to its facilities, and appropriate reserves. MWRA budgets on the accrual basis, its financial statements are reported on the accrual basis of accounting and the economic measurement focus as specified by the Governmental Accounting Standards Board's (GASB) requirements for an enterprise fund.

The MWRA distinguishes operating revenues and expenses from nonoperation items. Operating revenues and expenses generally result from providing water and sewer services to its member communities. All revenues and expenses not meeting this definition are reported as nonoperating revenues and expenses. All operating revenues are pledged for repayment of outstanding debt service.

In addition, MWRA applies the provisions of GASB Statement No. 62, Codification of Accounting and Financial Reporting Guidance Contained in Pre-November 30, 1989 FASB and AICPA Pronouncements, to provide a better matching of revenues and expenses. The effect of this policy has been to defer certain outflows of resources, which will be recovered through future revenues in accordance with MWRA's rate model, and to record deferred inflows of resources for revenue collected through current rates for costs expected to be incurred in the future.

### **Budget Surpluses**

In any year in which current revenue exceeds both current expenses on a budget basis and amounts required to meet bond coverage tests, the amount of over-recovery is deposited first to reserve funds, if any, which are below the level specified in any financing agreements, and second into MWRA's rate stabilization fund or bond redemption fund. Amounts deposited in these funds are used to offset rate requirements in subsequent years and such, to provide rate relief for our communities. With Board approval, surplus funds can also be used for targeted defeasance in future years and/or to reduce future liabilities, as part of a multi-year rate strategy. MWRA consults with the Advisory Board regarding the yearly use of these funds.

### **Budgeting and Assessment Objectives**

MWRA follows conservative budgeting practices, and has the following objectives in developing budgets and community assessments:

1. To minimize total costs, consistent with MWRA's statutory responsibilities to provide effective, environmentally sound wholesale water delivery and wastewater collection and treatment services;
2. To minimize the cost of debt;
3. To avoid single year assessment spikes by prudent management of cost and assessment increases, and
4. To support inter-generational equity by avoiding unfair assessment burdens on either current or future ratepayers.

### **Allocation of Costs and Revenue to Systems**

Most of MWRA's current expenses are directly attributable to either water or sewerage service costs or to investment in either the water or sewerage systems. Expenses which support both systems (indirect system costs) are allocated to the water or sewer system based on generally accepted cost allocation principles. Investment, contract, and other income offsets water and sewerage expenses on either a direct or allocated, indirect basis. The resulting net cost of water and sewerage services is the amount to be recovered through water and sewer assessments.

### **Allocation of Rate Revenue Requirements to User Assessments**

Users of MWRA wholesale water and sewerage services are assessed for those services according to MWRA's water and sewer assessment methodologies. Assessments for water services are computed by MWRA based on metered water use for the preceding calendar year. The total assessment is allocated based on each community's share of water delivered in the immediately preceding calendar year.

Assessments for sewer services are computed on the basis of a combination of metered wastewater flow and loads, and population.

- Operations and Maintenance (O&M) costs are allocated based on total annual metered wastewater flow, and total annual average strength, septage, and high strength flow loads.
- Capital (or debt service) costs are allocated based on a combination of metered wastewater flow and loads, and population. One-quarter of capital costs are allocated based on maximum month flow, and total annual average strength, septage, and high strength flow loads. The remaining three-quarters of capital costs are allocated based on population. Half of the population allocation is based on census population and half is based on contributing population.

### **Schedule and Procedure for Adoption of Assessments**

During the preparation of the proposed Current Expense Budget, required water and sewer rate revenue is determined, and a preliminary calculation of the allocation of costs to user-specific assessments is made. This information is provided to MWRA customers to assist them in their own fiscal planning. As provided in the Enabling Act, the proposed Current Expense Budget and preliminary assessments undergo statutory review, including public hearings and review by MWRA's Advisory Board. Further refinements of projected expenses and revenues also occur during this period. If review and analysis of the proposed Current Expense Budget results in lower projected expenses or higher projected revenue, some or all of such savings from preliminary estimates of assessments can be included in the adopted budget as additions to the rate stabilization fund and used to reduce rate revenue requirements in subsequent years. Alternatively, some or all of such savings can be used to reduce final assessments to customers below preliminary estimates.

The Current Expense Budget and final water and sewer assessments are adopted in June for the fiscal year beginning in July. The budget adopted in June may differ from the proposed budget as a result of review and further refinement of the proposed budget, although final assessments adopted by MWRA must be sufficient to recover water and sewer rate revenue requirements specified in the adopted budget. Final water and sewer rate requirements and their allocation to users may thus change from preliminary estimates. In addition, any individual community's final assessment may be higher or lower than the preliminary estimate, both because of changes in the factors which affect the allocation of assessments among wholesale customers, and because of differences between MWRA's proposed and final budgets as approved by the Board of Directors.

### **Review and Dispute Resolution Process**

MWRA annually determines preliminary and final assessments for water and sewer services in February and June prior to the beginning of the new fiscal year. These assessments must satisfy the requirement that MWRA fully recover its water and sewer costs by apportioning total costs as assessments among its wholesale water and sewer customers pursuant to its water and sewer rate methodologies and to certain specified data including:

- Calendar year metered water volume and metered wastewater flow obtained from MWRA's water and wastewater metering systems;
- Federal and state community census statistics, and sewer population estimates and other information supplied on Customer Service Update forms and Municipal Discharge Permits; and
- High strength user monitoring data and estimates of community septage volumes as obtained by MWRA's Toxic Reduction and Control Department.

The review and dispute resolution process provides MWRA's wholesale customers with the opportunity to review and comment on the reasonableness of the data used to calculate preliminary water and sewer assessments. During the year, MWRA provides its customers with

monthly summaries of water and wastewater flow data distributed, at a minimum, on a bimonthly basis. Because annual metered water and wastewater flows are major components for establishing water and sewer charges for each community, customers are strongly encouraged to review this data closely upon receipt and raise questions with MWRA staff concerning the data. MWRA expects that prompt customer review and comment on meter data will result in the resolution of most water and wastewater metering questions and assure the most consistency between preliminary assessments in February and final assessments announced in June. Community contributions of high strength flow and septage, and population data are made available with the release of preliminary assessments in February.

If after an initial review a community believes that specific data used to calculate assessments should be reevaluated, a community may submit a written objection to the Executive Director with a copy to the Rates Manager or their designee. The objection must be signed by the local official on record with MWRA as responsible for water or sewer services in the city, town, or district. The objection should state the community's concern with the data used to calculate community assessments, and should also include information and technical data to support the community's objection.

In order for any data adjustments to be incorporated into the allocation of final fiscal year assessments, all objections to data used to calculate preliminary assessments must be received no later than the date of the final public hearing on the proposed budget and preliminary assessments, held pursuant to Section 10 of the MWRA Enabling Act. MWRA staff will review and evaluate the merits of all written objections. Customers are notified in writing of the results of this review prior to the release of final assessments.

Adjustments to preliminary data, if any, are not retroactive beyond the applicable calendar year for proposed assessments. Final fiscal year assessments are calculated incorporating adjustments, if any, resulting from the review and objection process, and final rate revenue requirements as adopted by the Board of Directors.

Written objection(s) may also be submitted following the adoption of final fiscal year assessments, but no later than the end of the fiscal year for which the assessments are applicable. Objections submitted in this manner must also be directed to the Executive Director with a copy to the Rates Manager or their designee.

Following MWRA staff review, adjustments to assessments resulting from the challenge of rate basis data that are submitted following the adoption of final fiscal year assessments will be applied to the subsequent year's assessments. Customers are notified in writing of the results of this review and any assessment adjustments prior to the release of the subsequent year's assessments.

### **Water and Sewer Assessment Payment Schedule**

MWRA adopts a schedule of assessments and a schedule of payments annually. Any adjustments for prior years resulting from the review and objection process are apportioned to each of the

scheduled payment amounts. No interest is paid or billed by MWRA for previous year's adjustments.

Assessments are payable to MWRA in ten equal installments due on the first day of August, September, October, November, December, February, March, April, May, and June.

### **Interest Charge on Delinquent Payments**

For payments received after a payment due date MWRA levies an interest charge of one percent per month or 0.033 percent per day. Interest charges do not accrue until 30 days after the bills are mailed to MWRA's customer communities. Interest charges are added to subsequent regular billings.

### **Retail Rates**

MWRA assessments are for MWRA's provision of wholesale services. Local bodies which receive wholesale services in turn provide retail services to their users at the local level.

MWRA encourages its customers to establish retail rates which:

1. Recover the full cost of providing local water and/or sewerage services, including both direct costs and an allocation or estimate of indirect costs,
2. Charge users of local water and/or sewerage services in a manner which demonstrates to customers that increased use of services results in increased user costs,
3. Comply with MWRA policies directed to conservation of water; elimination of infiltration and inflow of surface water and ground water into the sewage collection, treatment, and disposal system; and removal or pretreatment of industrial wastes, and
4. To the extent consistent with #1 and #2, provide assistance to low income users through lifeline rates.

## CAPITALIZATION POLICY

It is the policy of the MWRA that capitalization of expenditures conforms to generally accepted accounting principles. Under such guidelines, MWRA has adopted the provisions of the Financial Accounting Standards Board's Statement No. 71, "Accounting for the Effects of Certain Types of Regulation," which is intended to assure that utility revenues are appropriately matched with incurred costs. Capital expenditures create assets or extend their useful lives. Assets are valued at their cost and provide benefits over an extended period of time. Sources of funds for capital expenditures include grants, proceeds of MWRA borrowing, loans, and current revenue.

Asset value created by MWRA is of two kinds. One is the value of tangible assets either created or increased through MWRA capital investments. Such assets include land, buildings, plant, equipment, and the system infrastructure for water and wastewater. The cost of such fixed asset investment includes not only purchase, rehabilitation, and construction cost, but also ancillary expenses necessary to make productive use of the asset. Ancillary costs can include, but are not limited to, costs for planning studies, professional fees, transportation charges, site preparation expenditures, and legal fees and claims directly attributable to the asset.

The second kind of asset value created by MWRA investment is the value of intangible assets. While such investment does not result in tangible MWRA assets, it does create a benefit to MWRA and its users over several years. Such assets include the cost of MWRA efforts to establish base-line leak detection information for the water systems of MWRA customers. The cost of providing water consumption-limiting devices to households is another example.

Expenditures for tangible assets are included in the Capital Improvement Program and Budget if the expected cost of the individual asset or capital project is \$100,000 or more and if the expected useful life is more than one year. Expenditures for intangible assets are capitalized if the expected cost is \$100,000 or more and if the expected benefit period is three years or more. Annually recurring costs and expenditures for maintenance of assets are not capitalized, even though their cost may exceed \$100,000. Examples of such maintenance expenditures include replacement of vehicles or computers, replacement of inoperable valves or other equipment before the anticipated useful life has been reached, and pipeline or interceptor repairs that do not add significant life to the underlying asset.

## RESERVES FUNDED FROM CURRENT REVENUE

### **Operating Reserve**

The Operating Reserve has been established to provide a source of funds to be used to pay operating expenses of the sewer or water systems should there not be sufficient funds otherwise available for that purpose. Bond agreements specify that the fund level shall not be less than one-sixth of MWRA's annual operating expenses.

### **Insurance Reserve**

The Insurance Reserve has been established to provide funds to restore, replace, or reconstruct lost or damaged property or facilities of the water or sewer system. It provides funds reserved against risks for which MWRA does not currently maintain insurance. This self-insurance reduces the cost MWRA might otherwise incur for purchased insurance policies. MWRA periodically evaluates the level of its insurance reserve and every three years a consulting engineer or an insurance consultant recommends an appropriate insurance reserve fund requirement. The current funding level of \$14.0 million has been determined to be adequate based on a FY17 Insurance Reserve Fund review performed by an outside insurance consultant who estimated an acceptable fund level in the range of \$12 to \$16 million. The next Insurance Reserve Fund review is expected in February 2020.

### **Renewal and Replacement Reserve**

The Renewal and Replacement Reserve has been established to pay the costs of emergency repairs or capital improvements to the system when funds are not available in either the Construction Fund or the Operating Fund. Amounts may not be withdrawn until MWRA has specified the project to which the amount will be applied, its estimated cost, and estimated completion date. It must also certify that such expenditures are reasonably required for the continued operation of the systems, or for maintenance of revenues, or that other provisions have not been made for funding such expenditures. The requirement of the Bond Resolution, every three years, MWRA receives recommendations from a Consulting Engineer as to the adequacy of the renewal and replacement reserve fund requirement. The Renewal and Replacement Reserve Fund requirement is presently established at \$35 million. The adequacy of the funding requirements for the Operating Reserve Fund and the Replacement Reserve Fund have been confirmed by the Consulting Engineer in its most recent triennial report dated October 2014, prepared and delivered in accordance with the General Resolution. The next Triennial Report is scheduled for October 2017. The Consulting Engineer also provides an opinion as to the adequacy of the Authority rates, rentals, and other charges.

## CURRENT EXPENSE BUDGET MANAGEMENT POLICIES AND PROCEDURES

### **A. Budget Allocations**

#### **Budget Contingency Holdbacks**

After the Board of Directors adopts the Current Expense Budget each year, the Executive Director, the Chief Operating Officer, or a division director may reserve between two percent and four percent of a division's approved budget as a budget contingency to be expended only upon approval of the Executive Director. The contingency holdback may be from any line item or cost center or combinations thereof, and any amount reserved as a budget contingency is not to be included in the monthly budget allocation process described below. The Administration, Finance, and Audit Committee will be notified of all budget contingency holdback amounts.

#### **Monthly Allocation of the Annual Current Expense Budget**

Initial monthly allocations are made for purposes of adopting and filing an operating budget in accordance with MWRA's financing agreements. Before the end of the first reporting period of the fiscal year, divisions, with the assistance of the Rates and Budget Department, allocate the approved budget, less any holdbacks, by month. The allocations set forth planned expenditures and accruals for each of the 12 months of the year to be compared to actual expenditures and accruals as reported in MWRA's monthly variance reports.

### **B. Budget Variance Monitoring and Analysis**

At the close of each monthly accounting period, the Controller Department prepares MWRA financial statements. The Rates and Budget Department then prepares monthly variance reports that compare budgeted to actual revenues and expenses.

#### **Variance Analysis**

Division directors and staff review variance reports and explain variances between budgeted and actual expenditures as requested by the Rates and Budget Department. Variance explanations are prepared as needed, usually at the first quarter of the year, and following monthly for the rest of the year. At least twice each year MWRA staff prepares forecasts of year-end expenditures and revenue. Barring extraordinary circumstances, division directors are responsible for controlling spending within the overall division budget. The Rates and Budget Department reviews all variances and projections so that appropriate measures may be taken to ensure that overall spending is within the MWRA's budget.

Variance explanations are submitted to the Rates and Budget Department in accordance with the schedule developed by the Rates and Budget Department. Each month the Rates and Budget Department prepares a summary of budget variances for inclusion in the Management Indicators Report (Yellow Notebook). The Rates and Budget Department also prepares a monthly staff summary (except for July and August) to the Board of Directors describing major budget

variances and a quarterly budget variance report for inclusion in the Board of Directors Report on Key Indicators of MWRA Performance (Orange Notebook). At least twice a year, the Rates and Budget Department prepares a staff summary to the Board of Directors on year-end projections of revenue and expenses.

### **C. Budget Amendments**

An amendment to an MWRA Current Expense Budget is defined as follows:

A proposed change in an adopted budget or a proposed budget transmitted to the MWRA Advisory Board in accordance with Section 8(b) of Chapter 372 of the Acts of 1984 which meets any of the following criteria:

1. Any increase in total current expenses.
2. An increase of five percent or more in total division expenses.
3. An increase in any expense line item (subsidiary account) of 15 percent or more if that line item is at least 2.5 percent of total current expenses.
4. An addition or deletion of a specific new program or initiative, the cost of which is greater than one percent of total current expenses, unless the addition or deletion has been specifically recommended by the Advisory Board.

The Executive Director, with the concurrence of the Chairman of the Board of Directors and the Chairman of the Administration, Finance, & Audit Committee of the Board of Directors, submits proposed amendments to the Advisory Board for comment and recommendation. At the end of the Advisory Board 30-day review period, the Board of Directors may take action on the amendment.

## CAPITAL BUDGET MANAGEMENT POLICIES AND PROCEDURES

### **General Guidelines**

The Authority shall periodically adopt and revise capital facility programs for the Waterworks and Sewer Systems and capital budgets based on these programs. The Authority shall consult in the preparation of its capital facility programs for the Sewer and Waterworks Systems with the Authority's Advisory Board and the Executive Office of Environmental Affairs, and may consult with other agencies of federal, state and local government concerned with the programs of the Authority. Proposed capital facility programs and capital expenditure budgets for said systems shall be submitted to the Advisory Board for such consultation no less than sixty days prior to adoption or revision by the Authority. The Authority shall prepare a written response to reports submitted to it by the Advisory Board, which response shall state the basis for any substantial divergence between the actions of the Authority and the recommendations contained in such reports of the Advisory Board. The Authority shall capitalize expenditures in accordance with generally accepted accounting principles. Capital expenditures will be planned in accordance with Authority financing agreements and policies for amortization of capital costs.

### **Capital Budget Contingency**

A contingency for each fiscal year is incorporated into the Capital Improvement Program for the purpose of providing for unanticipated or unpredictable expenditures under the CIP spending cap.

### **Capital Budget Monitoring and Reporting**

The Authority continually monitors the progress of capital projects for purposes of managerial control and decision-making and for financial planning and management. Two capital budget variance analysis reports are provided to the Board of Directors, one for the first six months of a year and one at year-end. The reports include a comparison between planned project schedules to actual performance. The reports highlight any major changes, either in scope or budget, of any project. Based on these reports, staff may recommend to the Board of Directors revisions, if appropriate, to the annual and five-year caps based upon said changes. In addition, capital budget progress reports are provided to the Board of Directors on a regular basis, both as project specific updates and in Quarterly Orange Notebook reports that shall include discussions of project progress compared to schedules. Monthly Financial Summary reports shall include discussions of capital expenditures compared to budget.

### **Capital Budget Spending Cap**

Beginning in June 2003, the Board of Directors established a five-year Capital Budget Spending cap and annual caps for each year within the cap period. Spending for any year in the cap period may vary within plus or minus 20% of the annual cap, as long as total spending for the five-year period does not exceed the five-year cap. Before the end of each five-year cap period, the Board will adopt a cap for the next five-year period and annual caps for each year in the period. The Board established the third five-year cap for the FY14-18 period at its June 2013 meeting.

### **Expenditures in Excess of the Spending Cap**

In the event of unanticipated spending requirements, the Executive Director may recommend to the Board of Directors that annual expenditures exceed an annual cap by more than 20% or that five-year expenditures exceed the current five-year CIP spending cap. In such an event, a proposed plan to adjust the five-year cap or any of the annual caps will be presented to the Board. Any such proposed plan will be submitted to the MWRA Advisory Board for review and comment for a period of thirty days. At the end of the thirty-day period, the Board of Directors may take action on the proposed plan.

### **Debt Limit**

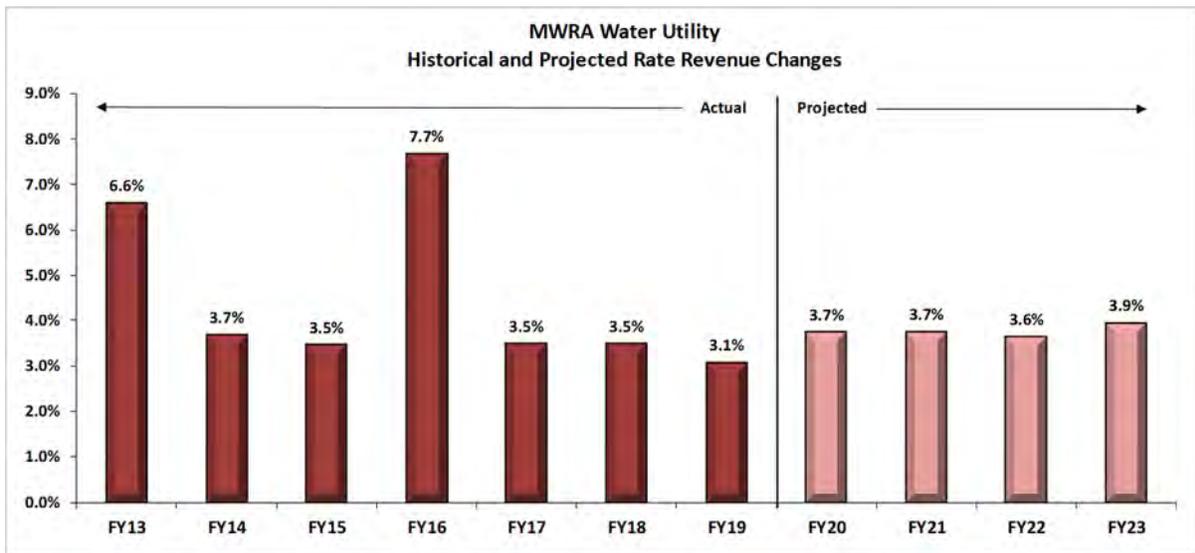
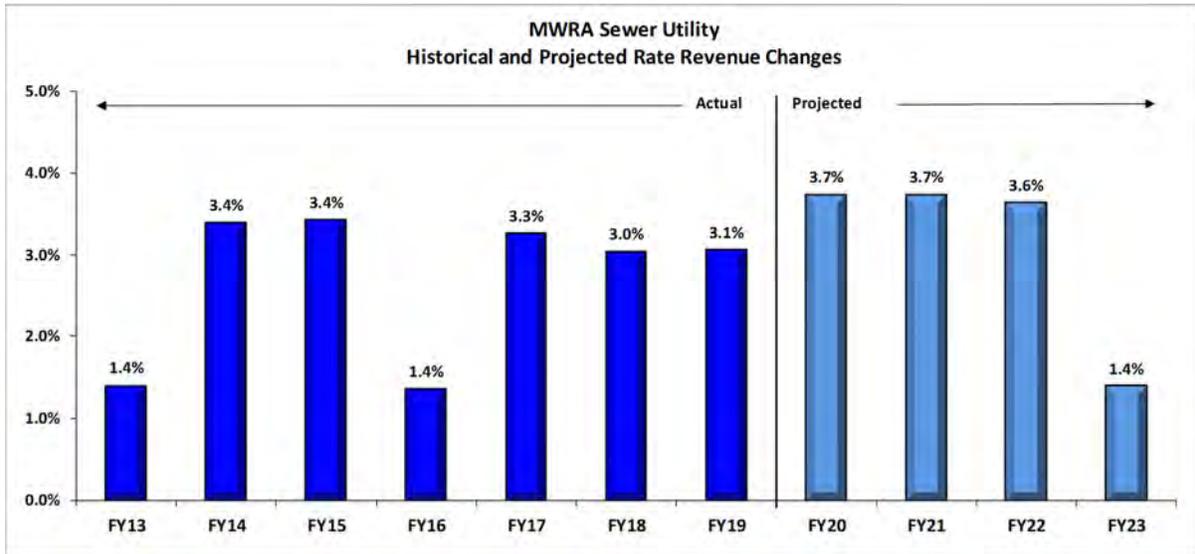
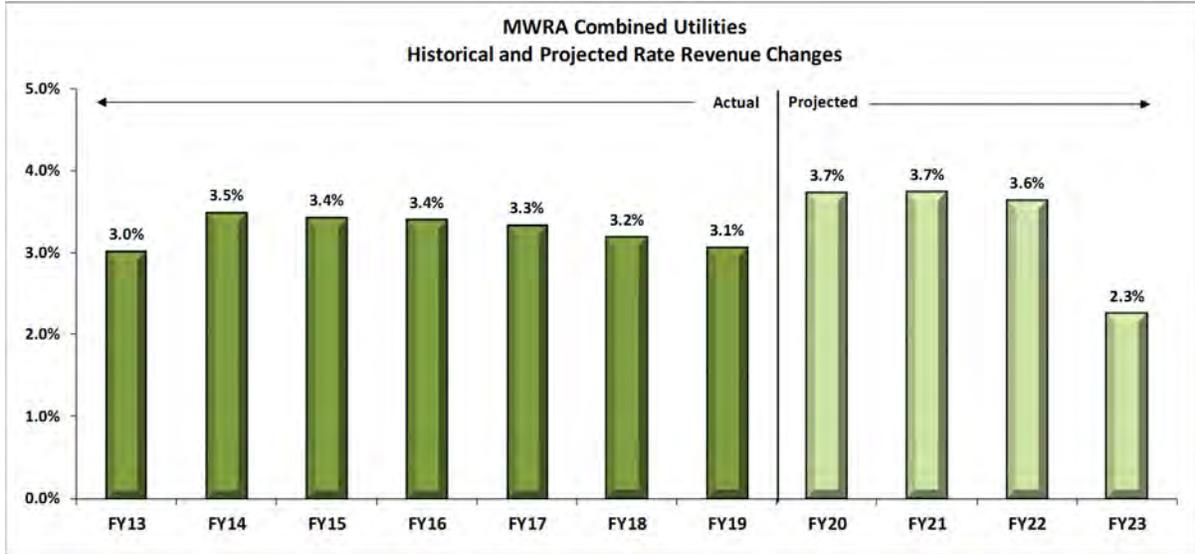
The Authority's statutory debt limit is \$6,450,000,000. The current debt is well below the debt limit. The Authority's debt limit was most recently amended by Chapter 312 of the Acts of 2008 of the Commonwealth of Massachusetts.

## APPENDIX D

MWRA Planning Estimates FY2019 to FY2028										
	FY2019	FY2020	FY2021	FY2022	FY2023	FY2024	FY2025	FY2026	FY2027	FY2028
<b>COMBINED UTILITIES</b>										
<b>EXPENSES</b>										
Direct Expenses	\$239,612	\$247,371	\$254,922	\$262,137	\$270,233	\$276,888	\$284,607	\$292,665	\$301,015	\$310,583
Indirect Expenses	45,963	50,355	54,401	54,978	59,263	59,776	62,391	61,594	63,458	65,400
Capital Financing (before offsets)	483,314	498,712	517,166	540,604	548,238	536,584	537,197	587,921	581,764	581,055
Sub-Total Expenses	\$768,888	\$796,438	\$826,488	\$857,720	\$877,735	\$873,248	\$884,195	\$942,180	\$946,237	\$957,037
Debt Service Assistance	(945)	0	0	0	0	0	0	0	0	0
Bond Redemption Savings	0	0	0	0	0	0	0	(23,500)	0	0
Variable Rate Savings	0	0	0	0	0	0	0	0	0	0
Total Expenses	\$767,944	\$796,438	\$826,488	\$857,720	\$877,735	\$873,248	\$884,195	\$918,680	\$946,237	\$957,037
<b>REVENUE &amp; INCOME</b>										
Non-Member and Other Revenue	\$15,342	\$15,532	\$15,843	\$16,162	\$16,079	\$16,375	\$16,649	\$16,950	\$17,236	\$17,534
Interest Income	13,559	14,249	15,326	17,291	18,824	19,791	20,772	21,561	22,524	23,213
Rate Stabilization	0	0	0	0	0	0	0	0	0	0
Total Other Revenue	\$28,902	\$29,781	\$31,169	\$33,453	\$34,903	\$36,165	\$37,421	\$38,511	\$39,760	\$40,747
Total Rate Revenue	\$739,042	\$766,658	\$795,319	\$824,267	\$842,831	\$837,082	\$846,774	\$880,169	\$906,476	\$916,290
Rate Revenue Increase	3.1%	3.7%	3.7%	3.6%	2.3%	-0.7%	1.2%	3.9%	3.0%	1.1%
Estimated Annual Household Charge **										
Based on water use of 61k gpy (weighted)	\$1,157	\$1,208	\$1,262	\$1,318	\$1,369	\$1,409	\$1,459	\$1,526	\$1,591	\$1,649
Based on water use of 90k gpy (weighted)	\$1,707	\$1,783	\$1,862	\$1,944	\$2,020	\$2,079	\$2,153	\$2,252	\$2,347	\$2,432
<b>WASTEWATER UTILITY</b>										
<b>EXPENSES</b>										
Direct Expenses	\$158,495	\$163,190	\$167,584	\$172,341	\$177,892	\$181,971	\$187,020	\$192,330	\$197,791	\$204,362
Indirect Expenses	13,525	17,106	20,089	19,701	22,852	22,200	23,600	21,549	22,105	22,699
Capital Financing (before offsets)	331,588	340,430	352,718	368,756	368,551	348,484	340,337	359,729	366,888	356,619
Sub-Total Wastewater Expenses	\$503,608	\$520,725	\$540,391	\$560,798	\$569,294	\$552,655	\$550,958	\$573,608	\$586,784	\$583,680
Debt Service Assistance	(856)	0	0	0	0	0	0	0	0	0
Bond Redemption Savings	0	0	0	0	0	0	0	(1,000)	0	0
Variable Rate Savings	0	0	0	0	0	0	0	0	0	0
Total Wastewater Expenses	\$502,752	\$520,725	\$540,391	\$560,798	\$569,294	\$552,655	\$550,958	\$572,608	\$586,784	\$583,680
<b>REVENUE &amp; INCOME</b>										
Non-Member and Other Revenue	\$5,229	\$5,341	\$5,457	\$5,577	\$5,692	\$5,789	\$5,905	\$6,047	\$6,188	\$6,319
Interest Income	8,335	7,920	8,513	9,638	10,427	10,849	11,218	11,672	12,225	12,511
Rate Stabilization	0	0	0	0	0	0	0	0	0	0
Prior Year Utility Surplus/Deficit Transfer	0	0	0	0	0	0	0	0	0	0
Total Other Revenue	\$13,565	\$13,261	\$13,969	\$15,216	\$16,119	\$16,639	\$17,123	\$17,719	\$18,413	\$18,830
Wastewater Rate Revenue	\$489,187	\$507,464	\$526,421	\$545,582	\$553,175	\$536,016	\$533,835	\$554,889	\$568,371	\$564,850
Rate Revenue Increase	3.1%	3.7%	3.7%	3.6%	1.4%	-3.1%	-0.4%	3.9%	2.4%	-0.6%
Estimated Annual Household Charge **										
Based on water use of 61k gpy (weighted)	\$699	\$730	\$763	\$797	\$825	\$840	\$865	\$905	\$942	\$970
Based on water use of 90k gpy (weighted)	\$1,031	\$1,077	\$1,125	\$1,175	\$1,217	\$1,239	\$1,276	\$1,335	\$1,389	\$1,431
<b>WATER UTILITY</b>										
<b>EXPENSES</b>										
Direct Expenses	\$81,117	\$84,182	\$87,338	\$89,797	\$92,341	\$94,917	\$97,587	\$100,335	\$103,224	\$106,221
Indirect Expenses	32,437	33,250	34,311	35,278	36,412	37,576	38,791	40,045	41,353	42,701
Capital Financing (before offsets)	151,726	158,282	164,448	171,848	179,687	188,100	196,859	228,191	214,875	224,435
Sub-Total Water Expenses	\$265,281	\$275,713	\$286,097	\$296,922	\$308,440	\$320,593	\$333,237	\$368,571	\$359,452	\$373,357
Debt Service Assistance	(89)	0	0	0	0	0	0	0	0	0
Bond Redemption Savings	0	0	0	0	0	0	0	(22,500)	0	0
Variable Rate Savings	0	0	0	0	0	0	0	0	0	0
Total Water Expenses	\$265,192	\$275,713	\$286,097	\$296,922	\$308,440	\$320,593	\$333,237	\$346,071	\$359,452	\$373,357
<b>REVENUE &amp; INCOME</b>										
Non-Member and Other Revenue	\$10,113	\$10,191	\$10,386	\$10,584	\$10,387	\$10,586	\$10,744	\$10,903	\$11,048	\$11,214
Interest Income	5,224	6,329	6,813	7,653	8,397	8,941	9,554	9,889	10,299	10,702
Rate Stabilization	0	0	0	0	0	0	0	0	0	0
Prior Year Utility Surplus/Deficit Transfer	0	0	0	0	0	0	0	0	0	0
Total Other Revenue	\$15,337	\$16,520	\$17,199	\$18,237	\$18,784	\$19,527	\$20,298	\$20,792	\$21,347	\$21,917
Water Rate Revenue	\$249,855	\$259,193	\$268,898	\$278,685	\$289,656	\$301,066	\$312,939	\$325,279	\$338,105	\$351,440
Rate Revenue Increase	3.1%	3.7%	3.7%	3.6%	3.9%	3.9%	3.9%	3.9%	3.9%	3.9%
Estimated Annual Household Charge **										
Based on water use of 61k gpy (weighted)	\$458	\$478	\$499	\$521	\$545	\$569	\$595	\$621	\$649	\$679
Based on water use of 90k gpy (weighted)	\$676	\$706	\$737	\$769	\$803	\$840	\$877	\$917	\$958	\$1,001

\*\* Annual household charges are estimated for communities that receive full water and wastewater services from MWRA weighted by the number of households in each of these core communities. Based on community responses to the 2017 MWRA Advisory Board's Annual Water and Sewer Retail Rate Survey.

## APPENDIX D



**APPENDIX E**  
**FY19 Final Current Expense Budget - Capital Financing Detail (as of 6/30/18)**

	Outstanding as of 6/30/18	Total	Sewer	Water
<b>SRF <sup>1</sup></b>				
Unrefunded (93A, 93D, 95A,98C)	\$ 420,000	\$ -	\$ -	\$ -
1999E Sewer		392,540	392,540	-
1999E Water	7,163,498	579,791	-	579,791
1999F	\$ 181,030,000	22,228,605	22,228,605	-
2000E Sewer		2,828,800	2,828,800	-
2000E Water	45,981,113	575,512	-	575,512
2001C Water		1,720,000	-	242,958
2001D Sewer		387,218	387,218	-
2001D Water	1,100,784	81,945	-	81,945
2002H Sewer		3,148,158	3,148,158	-
2002H Water	67,510,000	1,552,072	-	1,552,072
2002I Sewer		100,745	100,745	-
2002I Water	1,545,272	1,487	-	1,487
2003A	\$ 475,303	68,933	-	68,933
2003B	\$ 964,604	219,880	-	219,880
2003C Sewer		1,355,957	1,355,957	-
2003C Water	28,894,783	968,102	-	968,102
2004C Sewer		539,214	539,214	-
2004C Water	7,538,594	91,816	-	91,816
2004D Sewer		2,686,997	2,686,997	-
2004D Water	44,540,000	640,736	-	640,736
2005C Sewer		419,525	419,525	-
2005C Water	4,827,622	68,661	-	68,661
2005D Sewer		3,040,330	3,040,330	-
2005D Water	49,694,262	799,437	-	799,437
2005E Sewer		24,961	24,961	-
2005E Water	222,989	5,479	-	5,479
2006C Sewer	\$ 5,590,022	483,524	483,524	-
2006D Sewer		2,803,661	2,803,661	-
2006D Water	55,606,810	1,603,119	-	1,603,119
2006E Sewer		22,883	22,883	-
2006E Water	270,693	10,281	-	10,281
2007C Sewer		305,272	305,272	-
2007C Water	3,539,826	175,395	-	175,395
2007D Sewer	\$ 17,134,298	1,146,412	1,146,412	-
2007E Sewer		2,736,917	2,736,917	-
2007E Water	52,560,353	1,257,171	-	1,257,171
2008G Sewer		400,267	400,267	-
2008G Water	3,747,877	81,942	-	81,942
2009C Sewer		3,832,488	3,832,488	-
2009C Water	74,685,483	1,881,378	-	1,881,378
2009D Sewer		645,209	645,209	-
2009D Water	8,385,049	85,441	-	85,441
2010 D Sewer		1,420,903	1,420,903	-
2010 D Water	36,554,692	1,434,045	-	1,434,045
2011A Sewer		367,616	367,616	-
2011A Water	7,635,190	365,635	-	365,635
2012C Sewer		524,487	524,487	-
2012C Water	8,693,795	254,834	-	254,834
2012D Sewer		2,858,433	2,858,433	-
2012D Water	41,296,166	532,596	-	532,596
2013B Sewer		2,215,252	2,215,252	-
2013B Water	31,046,023	533,899	-	533,899
2014C Sewer		283,478	283,478	-
2014C Water	8,896,150	385,253	-	385,253
2015A Sewer		2,647,390	2,647,390	-
2015A Water	57,248,728	979,811	-	979,811
2015B Sewer		258,513	258,513	-
2015B Water	4,650,776	152,023	-	152,023
2016A Sewer		2,129,322	2,129,322	-
2016A Water	49,507,916	848,059	-	848,059
2017A Sewer		541,753	541,753	-
2017A Water	32,201,516	1,537,767	-	1,537,767
Pool 21 Sewer		2,784,035	2,784,035	-
Pool 21 Water		1,510,000	-	1,510,000

**APPENDIX E**  
**FY19 Final Current Expense Budget - Capital Financing Detail (as of 6/30/18)**

	Outstanding as of 6/30/18	Total	Sewer	Water
Pool 22 Sewer		2,784,035	2,784,035	-
Pool 22 Water		1,510,000	-	1,510,000
<b>Total SRF Debt</b>	<b>\$ 942,880,186</b>	<b>\$ 89,380,358</b>	<b>\$ 68,344,900</b>	<b>\$ 21,035,457</b>
<b>MWRA Senior Debt</b>				
2002J Refunding (Fixed)	189,020,000	31,210,338	28,089,304	3,121,034
2006B Refunding	-	-	-	-
2007B Refunding	647,950,000	34,017,375	28,574,595	5,442,780
2009B Refunding	126,415,000	71,398,500	51,406,920	19,991,580
2010B Refunding	95,945,000	23,178,000	13,443,240	9,734,760
2011B New	7,850,000	2,690,400	1,883,280	807,120
2011C Refunding	321,160,000	14,424,275	5,625,467	8,798,808
2012A New	74,590,000	3,627,300	1,813,650	1,813,650
2012B Refunding	86,775,000	4,240,325	890,468	3,349,857
2013A Refunding	102,515,000	4,934,850	2,763,516	2,171,334
2014D New	60,165,000	3,008,250	2,045,610	962,640
2014E Refunding	15,605,000	4,574,917	4,003,052	571,865
2014F Refunding	141,410,000	6,396,700	1,982,977	4,413,723
2016B New	63,370,000	4,354,050	2,177,025	2,177,025
2016C Refunding	678,185,000	32,224,400	16,434,444	15,789,956
2016D	104,260,000	4,524,000	2,940,600	1,583,400
2017B	68,240,000	4,669,000	2,334,500	2,334,500
2017C	249,500,000	12,067,700	5,430,465	6,637,235
2018B	107,580,000	6,498,600	3,899,160	2,599,440
2018C	21,900,000	1,095,000	821,250	273,750
FY 19 New Money		3,500,000	1,750,000	1,750,000
Defeasance Assumption				
<b>Total Senior</b>	<b>\$ 3,162,435,000</b>	<b>272,633,979</b>	<b>\$ 178,309,523</b>	<b>\$ 94,324,456</b>
<b>Subordinate Debt</b>				
1999B	\$ 54,700,000	\$ 5,986,167	\$ 3,591,700	\$ 2,394,467
2002C Refunding	35,120,000	1,229,200	409,692	819,508
2008A Refunding	209,425,000	20,784,116	18,290,022	2,494,094
2008C Refunding	86,300,000	19,546,197	18,764,349	781,848
2008E Refunding	133,640,000	8,778,812	8,076,507	702,305
2012E Refunding	59,950,000	3,614,644	759,075	2,855,569
2012G Refunding	36,900,000	12,320,997	11,828,157	492,840
2014A Refunding	50,000,000	1,750,000	157,500	1,592,500
2014B Refunding	64,755,000	12,984,417	1,168,598	11,815,819
2018A Refunding	50,610,000	3,287,744	690,426	2,597,318
2018D Refunding	50,000,000	1,750,000	157,500	1,592,500
<b>Total Subordinate Debt</b>	<b>\$ 831,400,000</b>	<b>92,032,294</b>	<b>\$ 63,893,527</b>	<b>\$ 28,138,767</b>
<b>Total SRF &amp; MWRA Debt Service<sup>2</sup></b>	<b>\$ 4,936,715,186</b>	<b>454,046,631</b>	<b>\$ 310,547,950</b>	<b>\$ 143,498,680</b>
<b>Other Capital</b>				
Water Pipeline Commercial Paper	\$ 175,000,000	4,750,393	-	4,750,393
Current Revenue/Capital <sup>3</sup>		14,200,000	13,490,000	710,000
Capital Lease		3,217,060	1,924,663	1,292,397
Debt Prepayment <sup>4</sup>		7,100,000	5,635,660	1,464,340
<b>Total Other Capital</b>	<b>\$ 175,000,000</b>	<b>\$ 29,267,453</b>	<b>\$ 21,050,323</b>	<b>\$ 8,217,130</b>
<b>Total Capital Financing (before Debt Service Offsets)</b>	<b>\$ 5,111,715,186</b>	<b>483,314,084</b>	<b>\$ 331,598,273</b>	<b>\$ 151,715,810</b>
Debt Service Offsets				
Debt Service Assistance		(944,726)	\$(856,061)	\$(88,665)
Bond Redemption			-	-
Total Debt Service Offsets		(944,726)	(856,061)	(88,665)
<b>Total Capital Financing</b>	<b>\$ 5,111,715,186</b>	<b>482,369,358</b>	<b>\$ 330,742,213</b>	<b>\$ 151,627,145</b>

<sup>1</sup> SRF debt service payments reflect net MWRA obligations after state and federal subsidies.

<sup>2</sup> Numbers may not add due to rounding.

<sup>3</sup> Current Revenue/Capital is revenue used to fund ongoing capital projects.

<sup>4</sup> Debt Prepayment will be used defeasance of bonds at end of fiscal year.

## **APPENDIX F**

### **Advisory Boards and Committees**

#### **The Advisory Board**

The Advisory Board is established by section 23 of the MWRA Enabling Act. The Advisory Board's primary purposes are as follows:

1. To appoints 3 members of the Board of Directors, with staggered 6-year terms.
2. To review and comment on the current expense and capital improvement budgets.
3. To approve expansion of the MWRA's service area, whether permanent or temporary.
4. To make recommendations to the governor and the legislature with respect to matters that affect the Authority.

The Authority's proposed annual current expenses budget and its capital improvement program budget must be submitted to the Advisory Board at least sixty days prior to the adoption of each budget by the Board of Directors. Amendments to the current expenses budget must be submitted to the Advisory Board at least thirty days prior to adoption, except in the event of emergencies. The Authority is required to provide a written response to any reports of the Advisory Board regarding its finances. The Advisory Board has provided the Authority with written comments to both the current expenses and the capital improvement budgets. The Advisory Board's budget for personnel and expenses is included in the Executive Division's budget.

#### **Water Supply Citizens Advisory Committee to MWRA (WSCAC)**

Originally formed in 1977 to review a proposed diversion of the Connecticut River for water supply to the metropolitan Boston area, WSCAC represents an unusual approach for engaging citizen participation in water resource policy decisions.

WSCAC advises the MWRA and the Department of Conservation and Recreation on water conservation and watershed protection strategies. The MWRA has implemented leak repair and demand management programs, avoiding the need for river diversion.

WSCAC's current focus is water quality - source protection and management of the watersheds, reservoirs and distribution system.

WSCAC worked with the New England Safe Drinking Water Task Force on the Safe Drinking Water Act reauthorization. WSCAC helped secure passage of state legislation - the Interbasin Transfer Act of 1983, the Water Management Act of 1985, and the Watershed Protection Act of 1992. State officials have tapped WSCAC for other statewide advisory groups.

## **The Wastewater Advisory Committee (WAC)**

The MWRA Board of Directors created WAC in 1990 to offer independent recommendations on wastewater policies and programs. WAC's mission is to be an independent public forum for holistic discussion of wastewater issues. Membership is designed to reflect the knowledge and interest of major affected constituencies: engineering and construction, environmental advocacy, planning, academic research, and business.

WAC's contractual duties are as follows:

1. Provide independent advice to the MWRA Board and staff on wastewater programs and policies directly related to the MWRA
2. Review and comment to the Authority on wastewater reports and proposed documents; offer independent advice on current and proposed wastewater program and policy directions to further MWRA objectives
3. Reflect the knowledge and interest of major affected constituencies, including
  - a. Engineering
  - b. Construction
  - c. Business/industry
  - d. Planning
  - e. Academic research
  - f. Environmental advocacy
4. Advise MWRA on wastewater planning
5. Increase citizen participation and education by providing MWRA with assistance in outreach. Review programs and explain plans & policies to citizens
6. Attend Authority working groups related to wastewater programs and policy, including the Advisory Board and WSCAC
7. Propose to the Authority ways to continue effective and efficient long-term public involvement in wastewater programs.

WAC's focus for 2017-2018 includes:

- Protecting the ratepayer's massive investment in clean water remains one of WAC's primary interests, and it will continue to monitor maintenance as well as progress on the CSO project.
- WAC is interested in the possibilities of further energy efficiency and renewable energy production at all MWRA facilities.
- Other areas of interest:
  - Co-digestion as it expands across New England
  - Marketability of Bay State Fertilizer
  - Climate Change impacts
  - Regulatory changes that might affect MWRA

## APPENDIX G

### MWRA Capital Improvement Program Overview

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In 1984, legislation was enacted to create the Massachusetts Water Resources Authority, an independent agency with the ability to raise its revenues from ratepayers, bond sales and grants. The primary mission was to modernize the area's water and sewer systems and clean up Boston Harbor. Since its establishment, the MWRA has invested over \$8.3 billion to improve the wastewater and waterworks systems serving its 61 customer communities. The system serves 3.0 million people and more than 5,500 businesses.

Since 1985, MWRA has been subject to a Clean Water Act enforcement action to end years of wastewater pollution of Boston Harbor and its tributaries from the old Deer Island and Nut Island treatment plants and combined sewer overflows (CSOs). The enforcement case was initiated by the Conservation Law Foundation in 1983 and taken up by the U.S. Environmental Protection Agency in 1985. The Commonwealth of Massachusetts, the Boston Water and Sewer Commission, the City of Quincy and the Town of Winthrop are also parties to the case.

The Orders of the Court set forth the schedules of activities to be undertaken to achieve compliance with the law. Since 1985, MWRA has complied with 420 milestones which include the completion of extensive new wastewater treatment facilities at Deer Island in Boston and Nut Island in Quincy, a residuals facility in Quincy, and 35 CSO control projects in Boston, Cambridge, Chelsea and Somerville which comprise the long-term CSO control plan, the last of which were completed in December 2015.

As part of compliance with the Court's Orders, MWRA was required to file monthly compliance and progress reports on its ongoing activities through December 15, 2000 and quarterly compliance and progress reports through December 2016. MWRA is currently required to submit bi-annual compliance and progress reports through December 2020.

During the same time, MWRA complied with regulatory mandates to improve waterworks facilities. The mandated waterworks projects included the MetroWest Water Supply Tunnel, the Carroll Water Treatment Plant, and several covered water storage facilities.

The mandated projects account for most of the Capital Improvement Program (CIP) spending. The five initiatives below account for over \$6.0 billion or 74% of spending to date:

- Boston Harbor Project - \$3.8 billion
- Combined Sewer Overflow - \$910 million
- MetroWest Tunnel - \$697 million
- Carroll Water Treatment Plant - \$423 million
- Covered Storage Facilities - \$239 million

As the MWRA reaches maturity as an agency, the infrastructure modernization and new facilities construction phase is nearing completion, and, barring new mandates, most of the Authority's future capital budget will be designated for Asset Protection, Water System Redundancy, Pipeline Replacement and Rehabilitation, and Business System Support.

Asset Protection focuses on the preservation of the Authority's building facilities. Water System Redundancy aims to reduce the risks of service interruption and allow for planned maintenance of the water system assets. Long-term water redundancy will be the largest future CIP initiative with estimated spending in excess of \$1.4 billion over 17 years. Pipeline Replacement and Rehabilitation focuses on the maintenance and replacement of water and sewer pipelines. Business System Support provides for the continuing improvement and modernization of technology and security systems.

The FY19 Final CIP reaffirms MWRA's commitment to the community financial assistance programs on both the water and wastewater side and includes the addition of Phases 11 and 12 of the Infiltration/Inflow (I/I) Program with funding of \$200 million and a new loan only phase for \$100 million.

Capital initiatives to date have been primarily funded through long-term borrowings, and the debt service on these outstanding bonds represents a significant and growing portion of the Authority's operating budget. As of June 30, 2018, MWRA's total debt was \$5.1 billion. The Authority's capital finance (debt service) obligation as a percent of total expenses has increased from 36% in 1990 to 62.8% in the Final FY19 Current Expense Budget.

The MWRA's credit ratings of Aa1 from Moody's, AA+ from S&P, and AA+ from Fitch, reflect strong management of financial performance, application of operating surpluses to early debt defeasance, satisfactory debt service coverage ratios, well maintained facilities, comprehensive long-term planning of both operating and capital needs, and the strong credit quality of its member service communities.

The development of the FY19 Final CIP presented added challenges as staff not only established the FY19 Final CIP, but set forth the five-year spending Cap for FY19-23 as well. FY19-23 will be the fourth five-year spending Cap since first introduced in 2003 to cover the FY04-08 period. The spending Cap represents targeted spending levels to ensure adequate capital funding while balancing the need for reasonable and predictable community assessments.

To arrive at the FY19 Final CIP and the FY19-23 spending Cap, the Authority identified the needs of the capital programs taking into account the recommendations of the Master Plan. The long-term strategy for capital work is identified in the Authority's Master Plan which was published in 2006, updated in 2013, and is currently being updated. The Master Plan serves as a road map for inclusion of projects in the CIP in every budget cycle.

The FY19 Final CIP represents an update to the FY18 CIP approved by the MWRA Board in June 2017. The spending projections are the result of prioritizing the projects, establishing realistic estimates based on the latest information, striking a balance between maintenance and infrastructure improvements, and ensuring that there is adequate support for MWRA's core operations to meet all regulatory operating permit requirements.

## FY19 New Projects

The FY19 CIP adds \$292.0 million in new projects of which Wastewater projects added total \$165.2 million while Waterworks projects total \$124.8 million.

FY19 New Projects by Expenditure Category  
(*\$s in millions*)

Category	Total Contract Amount	FY19-23 Spending
Wastewater	\$164.2	\$68.9
Waterworks	\$124.8	\$20.5
Business and Ops Support	\$3.0	\$3.0
<b>Total New Projects</b>	<b>\$292.0</b>	<b>\$92.4</b>

The following table shows the new projects added by major programs:

(*\$s in millions*)

Project	Total Contract Amount	FY19-23 Spending
I/I Local Financial Assistance Program (net of loan repayments)	\$150.0	\$63.7
Deer Island Asset Protection	\$14.2	\$5.2
Cathodic Protection	\$61.5	\$10.6
Carroll Water Treatment Plant Asset Protection	\$37.8	\$1.8
NHS Revere & Malden Pipeline Improvements	\$12.9	\$0.0
Watershed Land	\$5.0	\$5.0
Sudbury/Weston Aqueduct Repairs	\$3.9	\$0.0
Dam Projects	\$1.8	\$1.8
Waterworks Facility Asset Protection	\$1.4	\$0.8
Distribution System Facilities Mapping	\$0.5	\$0.5
Capital Maintenance Planning & Support	\$3.0	\$3.0
<b>Total New Projects</b>	<b>\$292.0</b>	<b>\$92.4</b>
<b>Total New MWRA Capital Projects (excludes Local Assistance Program)</b>	<b>\$142.0</b>	<b>\$28.7</b>

New projects with anticipated contract amounts of \$10 million or more for Wastewater are:

**Infiltration/Inflow Local Financial Assistance** - \$300 million. Phases 11 & 12 - \$200 million (\$100 million each new phase) structured as a 75% grant, 25% loan program for rehabilitation of local sewer collection systems. The MWRA has also added a \$100 million loan program to begin in FY 24 at the Advisory Board's request to allow communities that have exhausted I/I funding to continue rehabilitation of their local sewer lines.

**Deer Island Wastewater Treatment Plant - Hydroturbine Replacements** - \$11.2 million to replace the two 1.1 megawatt hydroturbine generators (HTGs) at Deer Island. Electricity is generated using the gravitational force of plant effluent as it drops down the outfall shaft



from the disinfection basins. Effluent flows into the intake channel beneath each HTG by opening computer-operated wicket gates. The hydroturbines came on line in July 2001. Because of the harsh environment at Deer Island, the equipment has reached the end of its useful life. The average savings generated by the hydroturbines is approximately \$458,000 per year.



New projects with anticipated contract amounts of \$10 million or more for Waterworks are:

**Cathodic Protection (Metropolitan System)** - \$61.5 million to replace the existing cathodic protection systems in order to maintain pipe and steel storage tank integrity.

**Carroll Water Treatment Plant Ozone Generator Replacement** - \$20.0 million to replace the ozone generators, which are currently scheduled to be rebuilt in 2022 and replaced by 2030.

**Sections 13 & 48 Rehabilitation** - \$12.9 million rehabilitation of 7,300 linear feet of Section 13 (36-inch cast-iron) and 7,300 linear feet of Section 48 (38-inch diameter riveted steel) in Stoneham, Malden and Melrose from the Gate House at Fells Reservoir to Pleasant Street in Malden. This project will improve hydraulics and water quality. Malden meters 16 and 187 and Medford meters 65 and 159 are connected to the distribution system via Sections 13 and 48. These four meters supply areas of the two communities at a generally higher elevation than the remaining community meters. Sections 13 and 48 are unlined cast-iron and steel water mains, respectively. Portions of these mains were disconnected from the Fells Reservoir in 1988 due to hydraulic and water quality problems, and to meet the Safe Drinking Water Act requirements.

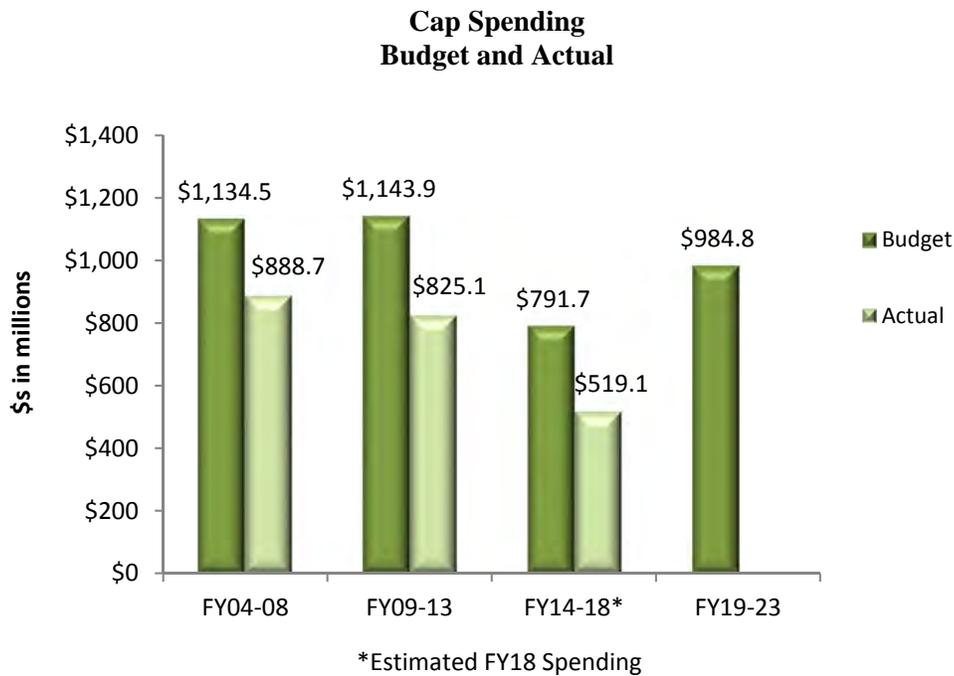
**Carroll Water Treatment Plant Ultraviolet (UV) Reactor Replacement** - \$10.0 million for replacement of the UV reactors which will likely be required by 2034.

A complete list of new projects with cash flows and descriptions can be found in Appendix 3.



### The Five-Year Spending Cap

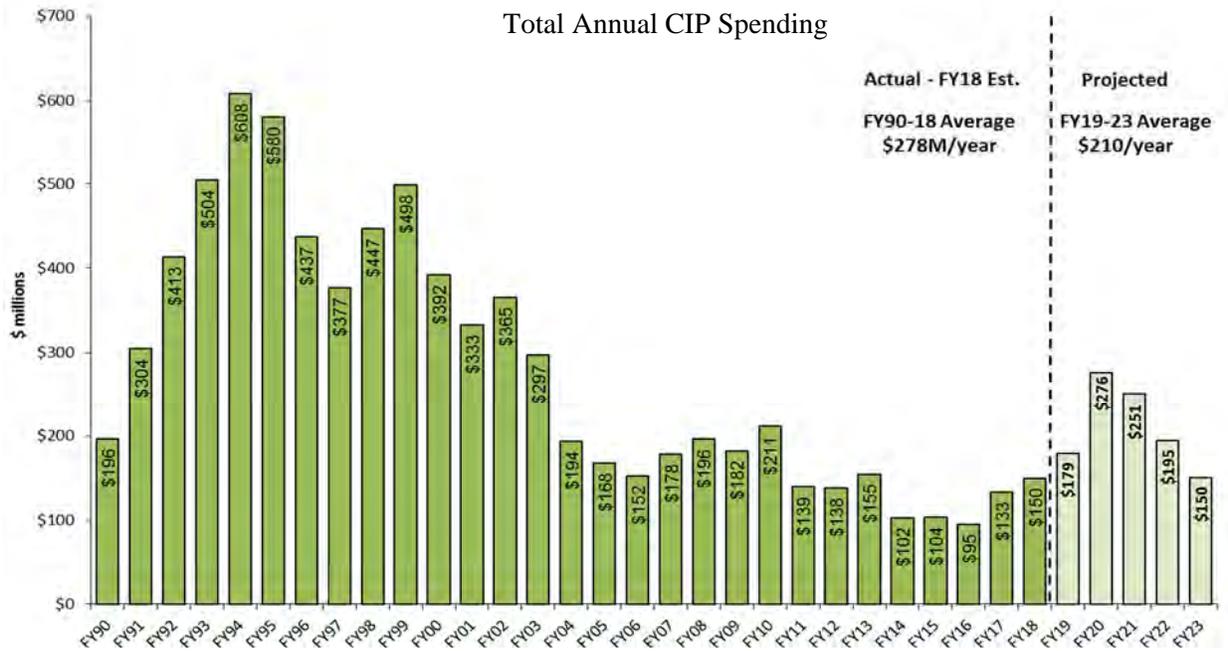
The concept of a five-year spending Cap was first introduced at the Advisory Board’s recommendation in 2003 for the FY04-08 period. The Cap represents targeted spending levels to ensure adequate capital program funding and to serve as a guide for long-term planning estimates and community assessments. The graph below describes the history of the past three five-year caps and the Final FY19-23 Cap, both in terms of the Cap budget levels and actual spending.

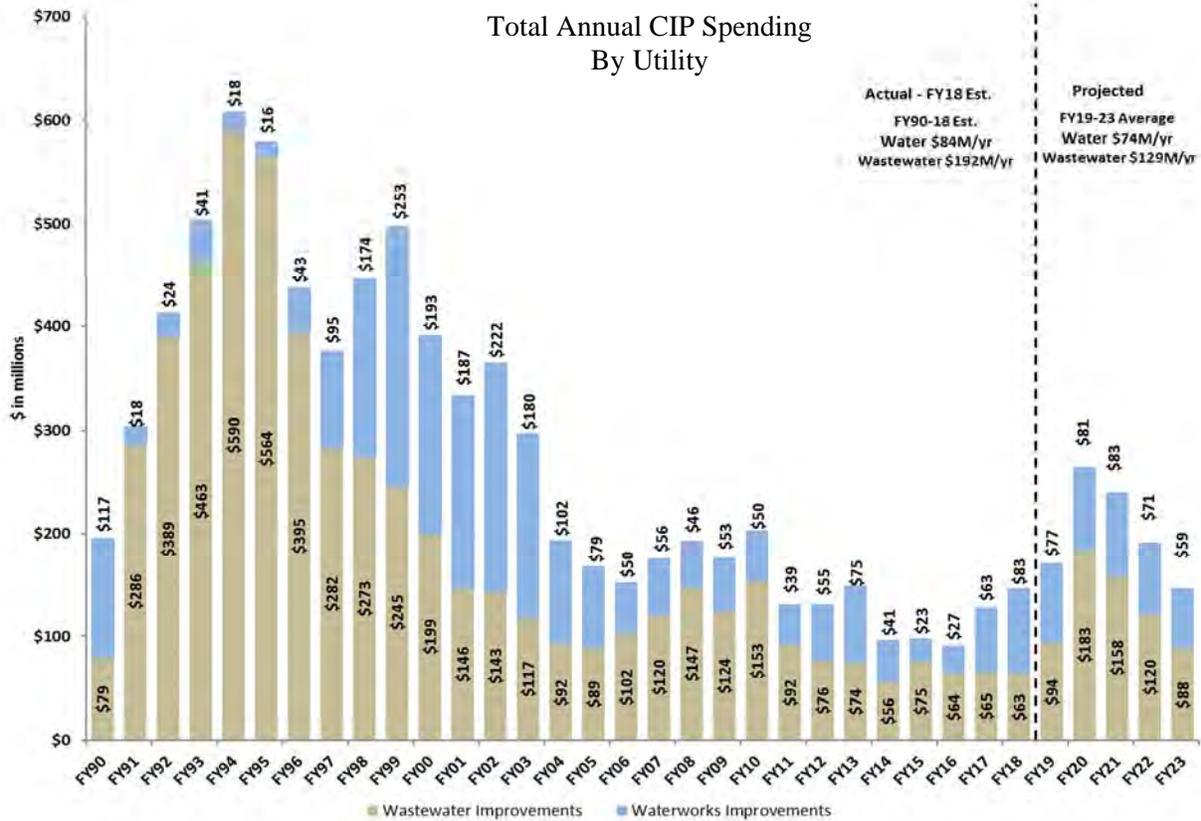


The FY14-18 Cap was significantly less than the prior two Caps for a variety of reasons: to meet the Authority’s goal of reducing outstanding debt, the largest driver of assessment increases, to recognize the nearing of the CSO program completion, to address the economic challenges facing our communities and ratepayers, and to satisfy the Advisory Board recommendation of less than \$800 million spending for the FY14-18 Cap period.

It is important to note that the spending on capital programs is largely determined by the nature, magnitude, and number of upcoming projects. In the prior five-year Caps, specifically FY04-08 and FY09-13, the majority of spending was driven by court-mandated projects and building new facilities. During the FY14-18 Cap, the Authority reached substantial completion on its court-mandated CSO Control Plan at an approximate total cost of \$910.0 million. The Authority’s main focus going forward is asset protection and water system redundancy.

The following two charts capture the historical CIP spending through FY18 and projected spending through FY23 based on the FY19 Final CIP both overall at the MWRA level and by utility. Average total annual CIP spending through FY18 was \$278 million. Average annual CIP spending for the Final FY19-23 Cap is projected to be \$210 million. Average annual CIP spending through FY18 was \$84 million for Waterworks and \$192 million for Wastewater. Average annual CIP spending for the Final FY19-23 Cap is projected to be \$74 million for Waterworks and \$129 million for Wastewater.





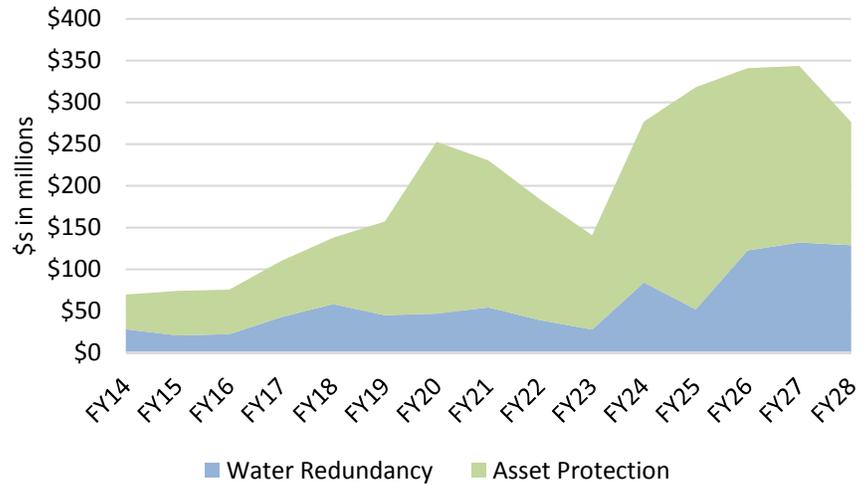
The FY19 Final CIP includes approximately \$1.0 billion in future expenditures for asset protection and continues to fund the critical redundancy for the Metropolitan Tunnels System at approximately \$1.4 billion over a seventeen-year period.

	Total FY19-23	Total FY24-28
<b>Wastewater System Improvements</b>	<b>\$643.2</b>	<b>\$802.0</b>
Interception & Pumping	188.7	283.0
Treatment	312.1	359.0
Residuals	11.5	32.4
CSO	7.7	-
Other Wastewater	123.2	127.6
<b>Waterworks System Improvements</b>	<b>\$370.1</b>	<b>\$849.4</b>
Drinking Water Quality Improvements	8.1	14.5
Transmission	129.4	510.6
Distribution & Pumping	159.6	286.5
Other Waterworks	72.9	37.7
<b>Business &amp; Operations Support</b>	<b>38.6</b>	<b>11.7</b>
<b>Total MWRA</b>	<b>\$1,051.8</b>	<b>\$1,663.1</b>

The table to the left depicts CIP projected spending for the FY19-23 Cap period and FY24-28 Cap period by major program categories for Wastewater Systems Improvements, Waterworks System Improvements and Business and Operations Support. The Metropolitan Tunnels Redundancy projects accounts for the increase in Transmission spending for Waterworks in the FY24-28 Cap period.

## Asset Protection and Water System Redundancy

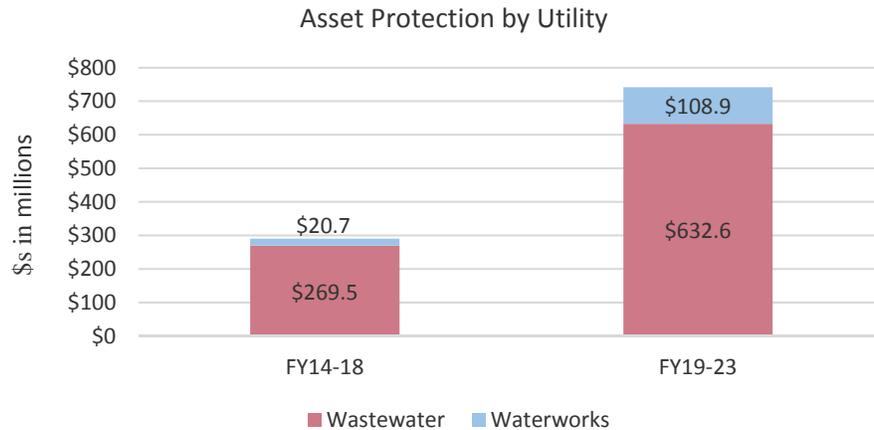
The next two waves of spending over the FY19-23 Cap period and the FY24-28 Cap period will be for asset protection and water redundancy. This reflects MWRA's commitment to maintaining its physical plant and addressing the need for water system redundancy in some critical service areas. Total asset protection spending for FY19-23 is projected at \$751.1 million or over 71% of projected spending. Wastewater and Waterworks Asset Protection are \$633 million and \$109 million, respectively. The Deer Island Treatment Plant Asset Protection accounts for over \$305 million in spending. Water system redundancy spending for FY19-23 is projected at \$213.7 million or over 20% of projected FY19-23 spending. However, the FY19-23 period includes only \$14.5 million related to the Metropolitan Tunnels System. Looking ahead to the FY24-28 Cap period, Asset Protection and the Water System Redundancy accounting for almost 94% of the total expenditures.



Changing nature of the CIP by Category  
(\$s in millions)

Project Category	FY14-18	FY19-23	FY24-28
Asset Protection	\$294.8	\$751.1	\$1,036.0
Carroll WTP	11.8	3.4	9.3
Water Redundancy	173.0	213.7	520.1
CSO	64.7	7.7	0.0
Other	51.3	75.9	97.8
<b>Total</b>	<b>\$595.6</b>	<b>\$1,051.8</b>	<b>\$1,663.1</b>
<b>Asset Protection</b>	<b>49.5%</b>	<b>71.4%</b>	<b>62.3%</b>
Carroll WTP	2.0%	0.3%	0.6%
<b>Water Redundancy</b>	<b>29.0%</b>	<b>20.3%</b>	<b>31.3%</b>
CSO	10.9%	0.7%	0.0%
Other	8.6%	7.2%	5.9%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

In terms of utility spending for asset protection, wastewater accounts for more than 60% of the FY19-23 projected spending at \$632.6 million, including \$305.3 million for the Deer Island Wastewater Treatment Plant and \$288.3 million for headworks and pipelines. The \$108.9 million targeted for waterworks includes over \$60.1 million for water pipeline rehabilitation or replacement. The graph below illustrates the marked increase in spending for asset protection from the FY14-18 to the FY19-23 Cap



### FY19-23 Spending Cap

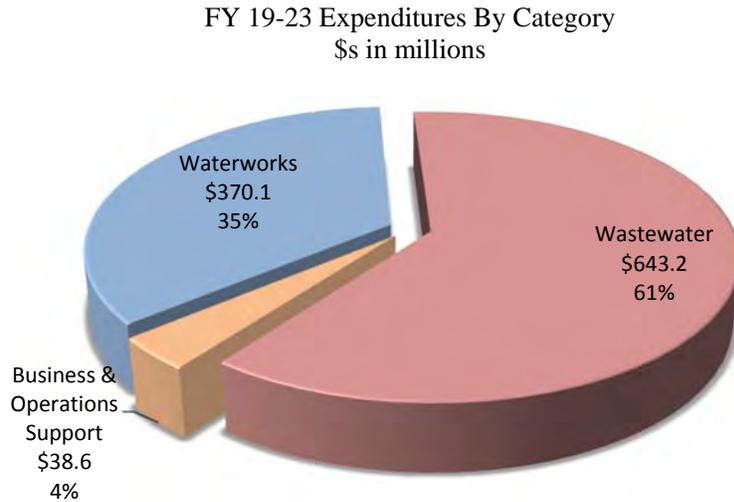
MWRA spending during the FY19-23 timeframe is planned to be \$984.8 million, with additional net spending of \$123.2 million for the community I/I (Infiltration and Inflow) loan and grant program and \$32.4 million for the community water pipeline loan program. Annual cash flows for the Cap period are shown below in millions:

						Total
	FY19	FY20	FY21	FY22	FY23	FY19-23
<b>FY19 Final</b>						
Projected Expenditures	\$179.2	\$276.1	\$251.3	\$194.9	\$150.4	\$1,051.8
I/I Program	(19.2)	(25.7)	(24.3)	(27.9)	(26.1)	(123.2)
Water Loan Program	(8.3)	(8.4)	(7.2)	(5.6)	(2.8)	(32.4)
<b>MWRA Spending</b>	<b>151.7</b>	<b>241.9</b>	<b>219.7</b>	<b>161.4</b>	<b>121.4</b>	<b>\$896.2</b>
Contingency	9.9	15.9	14.5	11.0	8.2	59.4
Inflation on Unawarded Construction	0.7	5.0	7.8	7.2	8.5	29.3
Chicopee Valley Aqueduct Projects	(0.0)	0.0	0.0	0.0	0.0	(0.0)
<b>FY19 Final FY19-23 Spending</b>	<b>\$162.3</b>	<b>\$262.8</b>	<b>\$242.0</b>	<b>\$179.6</b>	<b>\$138.1</b>	<b>\$984.8</b>

The format of the Cap table has changed from prior cap periods to account separately for MWRA spending, which excludes the local I/I grant and loan program and the local water pipeline loan spending which are both outside of MWRA's control. As in past Caps, contingency for each fiscal year is incorporated into the CIP to fund the uncertainties inherent to construction. The contingency budget is calculated as a percentage of budgeted expenditure outlays. Specifically, contingency is 7% for non-tunnel projects and 15% for tunnel projects. Inflation is added for

unawarded construction contracts. Finally, the Cap excludes Chicopee Valley Aqueduct system projects.

Total Projected Expenditures for the Final FY19-23 Cap period by category, including community loan and grant programs, is illustrated in the pie chart below:



Breaking down the expenditures further, yearly projected spending for the FY19-23 Cap period by program, including community loan and grant programs, are shown below in millions:

	FY19	FY20	FY21	FY22	FY23	Total FY19-23
<b>Wastewater System Improvements</b>	<b>\$93.8</b>	<b>\$183.2</b>	<b>\$157.5</b>	<b>\$120.4</b>	<b>\$88.2</b>	<b>\$643.2</b>
Interception & Pumping	46.9	71.7	47.0	12.9	10.1	188.7
Treatment	21.9	78.7	82.0	78.6	50.9	312.1
Residuals	3.2	4.3	1.8	1.0	1.1	11.5
CSO	2.6	2.7	2.4	-	-	7.7
Other Wastewater	19.2	25.7	24.3	27.9	26.1	123.2
<b>Waterworks System Improvements</b>	<b>\$77.1</b>	<b>\$80.9</b>	<b>\$82.5</b>	<b>\$71.1</b>	<b>\$58.5</b>	<b>\$370.1</b>
Drinking Water Quality Improvements	1.7	2.2	1.9	1.8	0.5	8.1
Transmission	14.7	18.7	36.2	31.7	28.2	129.4
Distribution & Pumping	41.1	47.5	30.5	22.6	18.1	159.6
Other Waterworks	19.6	12.6	13.9	15.0	11.8	72.9
<b>Business &amp; Operations Support</b>	<b>8.3</b>	<b>11.9</b>	<b>11.3</b>	<b>3.4</b>	<b>3.6</b>	<b>38.6</b>
<b>Total MWRA</b>	<b>\$179.2</b>	<b>\$276.1</b>	<b>\$251.3</b>	<b>\$194.9</b>	<b>\$150.4</b>	<b>\$1,051.8</b>

It is important to emphasize that the majority of spending within the Wastewater and Waterworks programs is concentrated in several larger projects with significant spending in the FY19-23 timeframe. Project contracts with expenditures greater than \$15 million for the FY19-23 Cap total \$689.6 million, including local community assistance programs, account for nearly 65.6% of spending.

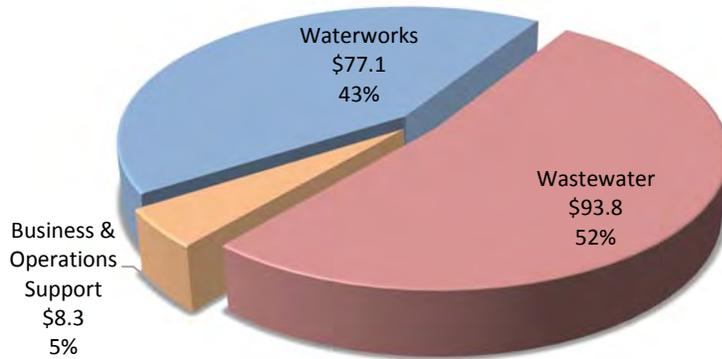
Project	Contract	Projected FY19-23 Expenditures \$s in millions
206 DI Treatment Plant Asset Protection	Clarifier Rehabilitation Phase 2 - Construction	\$129.9
765 Local Water Pipeline Improvement	Phase 3 Loans - Distributions	\$76.0
765 Local Water Pipeline Improvement	Phase 2 Loans - Distributions	\$61.9
145 Facility Asset Protection	Chelsea Creek Headworks Upgrades - Construction	\$49.3
206 DI Treatment Plant Asset Protection	HVAC Equipment Replacement - Construction	\$40.2
132 Corrosion & Odor Control	Nut Island Odor Control HVAC Improvements - Construction	\$38.2
128 I/I Local Financial Assistance	Phase X Grants	\$36.0
145 Facility Asset Protection	Prison Point Rehabilitation - Construction	\$31.7
128 I/I Local Financial Assistance	Phase XI Grants	\$28.5
128 I/I Local Financial Assistance	Phase IX Grants	\$24.0
765 Local Water Pipeline Improvement	Lead Service Line Replacement Loans	\$24.0
128 I/I Local Financial Assistance	Phase XII Grants	\$21.0
206 DI Treatment Plant Asset Protection	Fire Alarm System Replacement - Construction	\$20.0
628 Metro Redundancy Interim Improvement	WASM 3 Construction 1	\$19.8
206 DI Treatment Plant Asset Protection	Gravity Thickener Rehabilitation	\$19.6
722 NIH Redundancy & Storage	Section 89 & 29 Redundancy - Construction 2	\$19.2
727 SEH Redundancy and Storage	Redundancy Pipeline Sect 111 - Construction 3	\$19.0
722 NIH Redundancy and Storage	Section 89 & 29 Replacement - Construction	\$16.0
618 Peabody Pipeline Project	Peabody Pipeline - Construction	\$15.2
	<b>Total Contracts &gt; \$15.0 million</b>	<b>\$689.6</b>
	<b>% of FY19-23 Spending</b>	<b>65.6%</b>
	<b>Excluding Community Loan Programs</b>	<b>\$442.1</b>
	<b>% of FY19-23 Spending</b>	<b>42.0%</b>

The FY19-23 timeframe is dominated by several large projects with the top five construction projects totaling nearly \$289.3 million and accounting for 27.5% of FY19-23 spending. Large initiatives include the Clarifier Rehabilitation at Deer Island and Chelsea Creek Upgrades at \$129.9 and \$49.3 million, respectively.

### **FY19 Spending**

The FY19 Final CIP forecasts \$179.2 million spending for FY19, of which \$93.8 million supports Wastewater System Improvements, \$77.1 million supports Waterworks System Improvements, and \$8.3 million is for Business and Operations Support. Included in the \$179.2 million are net expenditures of \$27.5 million for community assistance programs: \$19.2 million for the local I/I program and \$8.3 million for the local water pipeline program.

FY19 Expenditures By Category  
 \$s in millions



Project contracts with spending greater than approximately \$5 million in FY19, excluding local community assistance programs, total \$71.4 million and account for nearly 40% of the total projected annual spending.

Project	Contract	Projected FY19 Expenditures \$s in millions
Facility Asset Protection	Chelsea Creek Headworks Upgrades - Construction	\$27.2
Local Water Pipeline Improvement	Phase 2 Loan Distributions	\$20.0
NIH Redundancy & Storage	Northern Intermediate High Section 89 & 29 - Construction 2	\$12.8
SEH Redundancy & Storage	Southern Extra High Pipeline Section 111 - Construction 2	\$8.2
Local Water Pipeline Improvement	Phase 3 Loan Distributions	\$8.0
SEH Redundancy & Storage	Southern Extra High Pipeline Section 111 - Construction 3	\$7.6
I/I Local Financial Assistance	Phase X Grants	\$7.5
I/I Local Financial Assistance	Phase IX Grants	\$7.5
Waterworks Facility Asset	Painting Bellevue 2, Turkey Hill Tanks	\$5.6
Corrosion & Odor Control	Nut Island Odor Control HVAC Improvement - Construction	\$5.2
DI Treatment Plant Asset Protection	Clarifier Rehabilitation Phase 2 - Construction	\$4.9
	<b>Total Contracts &gt; \$5.0 million</b>	<b>\$114.4</b>
	<b>% of FY19 Spending</b>	<b>63.8%</b>
	<b>Excluding Community Loan Programs</b>	<b>\$71.4</b>
	<b>% of FY19 Spending</b>	<b>39.8%</b>
	<b>Total Projected FY19 Spending</b>	<b>\$179.2</b>

Contracts with the highest spending for FY19 are described below:

**Chelsea Creek Headworks Upgrade Construction** - \$27.2 million (\$80.5 million total construction cost). This major rehabilitation project includes replacement/upgrade to the screens, grit collection system, grit and handling systems, odor control systems, HVAC, mechanical, plumbing and instrumentation. Solids handling systems are being automated and the building's egress and fire suppressions systems are also being upgraded.



**Northern Intermediate High Section 89 & 29 Redundancy Construction Phase 2** - \$12.8 million (\$22.7 million total construction cost). This is a redundancy project for MWRA's Northern Intermediate High service area. Currently, this area is primarily supplied by a single 48-inch diameter pipeline, the Gillis Pump Station, and water distribution storage from the Bear Hill Tank. This project includes a new seven-mile redundant pipeline under four construction phases. This project will provide uninterrupted water supply to the service area in the event of a failure of the existing single supply

pipe and will allow the existing pipe to be removed from service for inspection, maintenance, and repair. Phase 1A was completed; Phase 1B has reached substantial completion. Phase 1C and Phase 2 commenced in January 2017 and September 2017, respectively.

**Southern Extra High Redundancy Section 111 Phase 2 & 3 Construction** - \$15.8 million (\$36.4 million total construction cost). This is a redundancy project for MWRA's Southern Extra High service area. This project will provide redundancy to Sections 77 and 88 serving Boston, Norwood, Stoughton, and Dedham-Westwood, through construction of a redundant pipeline. Phase 1 will be substantially complete in September 2018. Phase 2 began in October 2017 and Phase 3 was awarded in May 2018.



**Nut Island Odor Control and HVAC Improvements - Construction Phase 2** - \$5.2 million (\$38.2 million total construction cost). Improvements to the Nut Island Headworks odor control, HVAC and energy management systems. These are the long-term improvement projects that arose following the January 2016 fire and the odor control, HVAC and energy management systems evaluation contract completed in February 2017.



**Steel Tanks Repainting: Bellevue 2, Turkey Hill** - \$5.6 million (\$5.7 million total construction cost). This contract includes the repainting of two (Bellevue 2 and Turkey Hill) out of six steel water distribution storage tanks. The remaining four steel tanks (Deer Island, Bellevue 1, Arlington Heights and Walnut Hill) require structural and SCADA improvements and repainting will be included with these improvements under future contracts. The Deer Island water tank repainting and improvements will be done under a separate contract.



**Deer Island Wastewater Treatment Plant Asset Protection:**



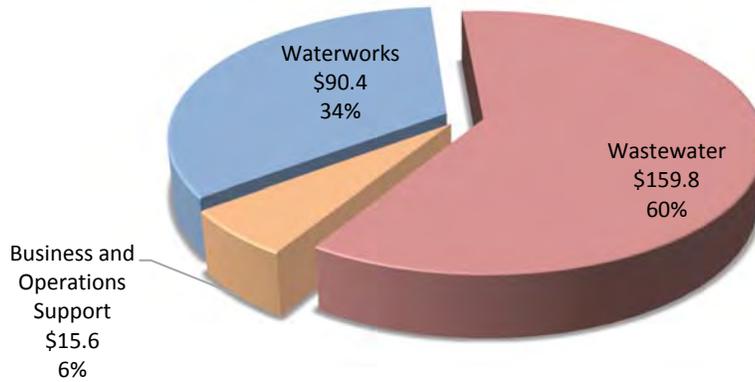
**Clarifier Rehabilitation Phase 2 Construction** - \$4.9 million (\$129.9 million total construction cost). This project will rehabilitate the sludge removal system in the primary tanks and the aeration/recirculation systems in the secondary tanks. The influent gates, effluent launders and aeration systems, and concrete corrosion in primary clarifiers will also be addressed and repaired. This contract is expected to commence in November 2018.

## FY19 Anticipated Contract Awards

In FY19, 55 contracts totaling \$405.7 million are projected to be awarded. The largest fifteen projected contract awards total \$343 million and account for nearly 85% of expected awards.

Program / Project	Subphase	Total Contract Amount
DI WastewaterTreatment Plant Asset Protection	Clarifier Rehabilitation Phase 2 - Construction	\$129.9
DI WastewaterTreatment Plant Asset Protection	HVAC Equipment Replacement - Construction	\$40.2
Corrosion & Odor Control	Nut Island Odor Control HVAC Improvements - Construction Phase 2	\$38.2
Facility Asset Protection	Prison Point Rehabilitation - Construction	\$31.7
DI Wastewater Treatment Plant Asset Protection	Fire Alarm System Replacement - Construction	\$20.0
Peabody Pipeline Project	Peabody Pipeline - Construction	\$15.2
New Connecting Water Mains-Shaft 7 to Weston Aqueduct Supply Main 3	Sections 23,24,47 Rehabilitation	\$14.3
DI WastewaterTreatment Plant Asset Protection	Motor Control Center & Switchgear Replacement - Construction	\$10.6
Metropolitan Tunnels Redundancy	Conceptual Design - Environmental Impact Report	\$9.0
Metropolitan Tunnels Redundancy Interim Improvements	Commonwealth Ave Pump Station Improvements - Construction	\$7.0
Metropolitan Tunnel Redundancy Interim Improvements	Chestnut Hill Emergency Pump Station Design/Construction Administration/Resident Inspection	\$6.7
Waterworks Facility Asset Protection	Painting Bellevue 2 and Turkey Hill Tanks	\$5.7
Facility Asset Protection	Interceptor Renewal 3, Dorchester Interceptor Sewer - Construction	\$5.6
Northern High System - Revere & Malden Pipeline Improvements	Section 53 and 99 Connections - Design/Construction Administration/Resident Inspection	\$4.8
DI WastewaterTreatment Plant Asset Protection	South System Pump Station VFD Replacement Design/Engineering Services During Construction/Resident Engineer Inspection	\$4.5
<b>Top 15 Contract Awards</b>		<b>\$343.4</b>

FY19 Planned Contract Awards  
 \$s in millions



### Community Loan Programs

The MWRA offers its water and wastewater communities loan and grant opportunities for infrastructure preservation. Community loans are interest-free and repaid to MWRA over a 5-year or a 10-year period. On the water side, the program's goal is to improve local water system pipeline conditions to help maintain high water quality distribution from MWRA's treatment plant through local pipelines to customers' taps. The water loan program was established in 1988 and over 527 miles of pipeline have been improved. Similarly, on the wastewater side, the local financial assistance program provides MWRA sewer communities funding to perform local infiltration and inflow "I/I" reduction and sewer rehabilitation. The I/I program was established in 1993 and funds are currently approved for distribution through Fiscal Year 2025. Unlike the water loan program, the I/I program is a partial grant program.

In FY19, \$300 million was added to the I/I Program, including I/I Phases 11 and 12 of \$100 million each at 75% loan/25% grant plus an additional \$100 million loan only program.

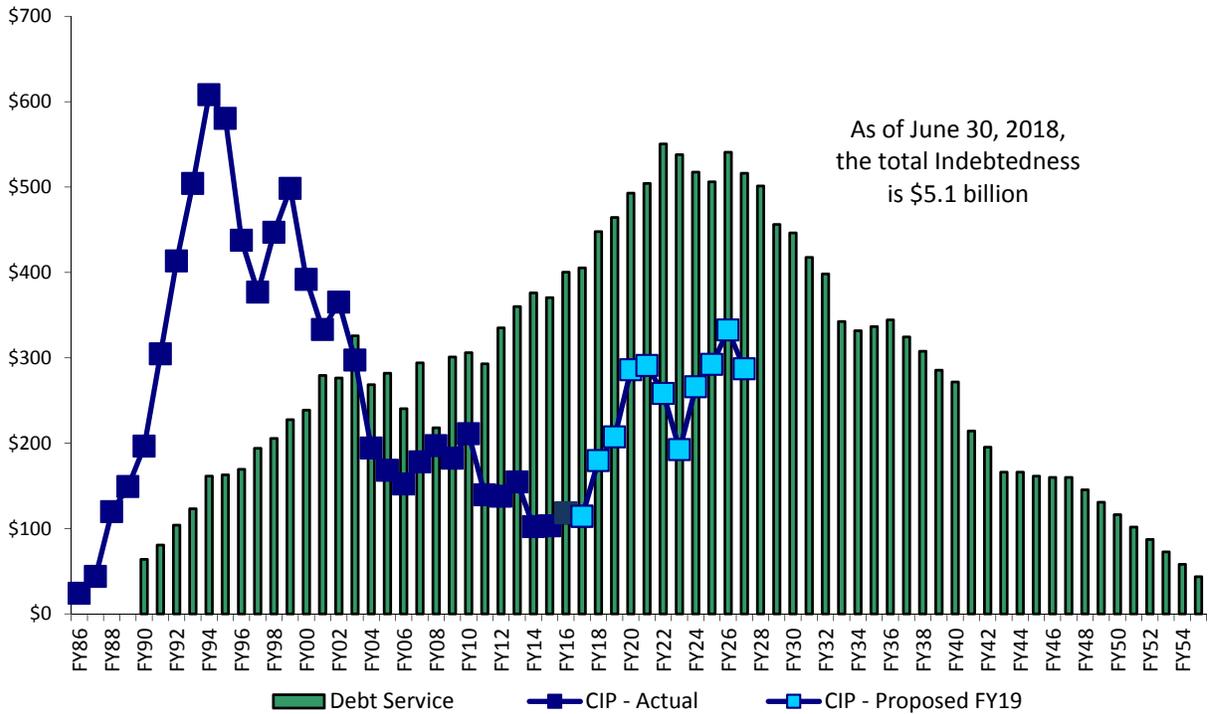
Over the FY19-23 timeframe \$123.2 million in funding is projected to be distributed to MWRA wastewater communities and \$32.4 million is projected to be distributed to MWRA water communities.

	FY19	FY20	FY21	FY22	FY23	FY19-23
I/I Local Financial Assistance (net of repayments)	\$19.2	\$25.7	\$24.3	\$27.9	\$26.1	\$123.2
Local Water Pipeline Improvements (net of repayments)	\$8.3	\$8.4	\$7.2	\$5.6	\$2.8	\$32.4

## MWRA Capital Improvement Spending and Debt Service

As of June 30, 2018, MWRA's total debt is \$5.1 billion, which is \$102.3 million less than the MWRA's total debt as of June 30, 2017. While total outstanding debt is decreasing, debt service obligations continue to rise and are projected to increase in coming years.

MWRA CIP Spending and Debt Service  
\$s in millions

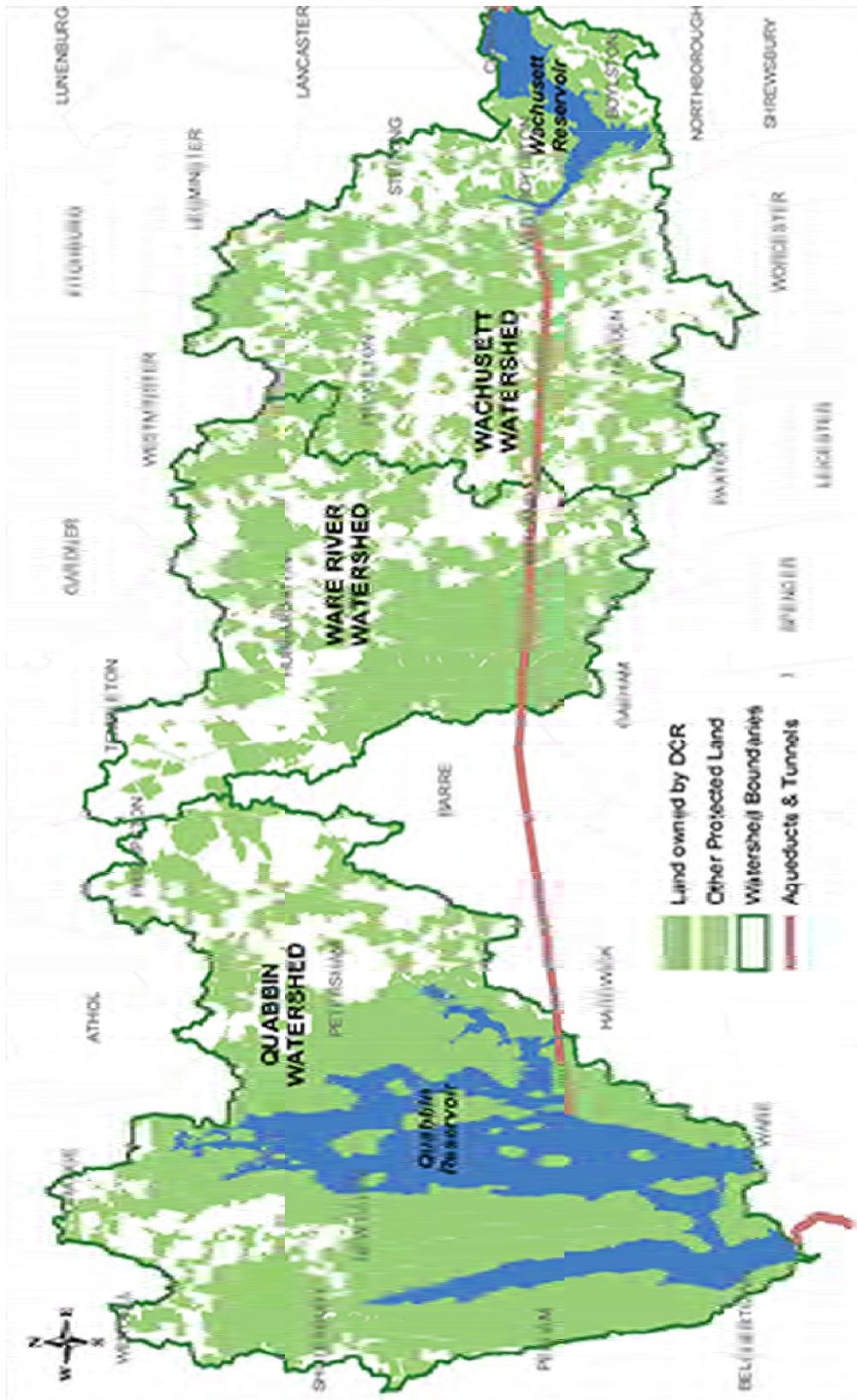




APPENDIX H

<b>WATER SUPPLY PROTECTION TRUST</b>				
<b>Expenditures and Revenues Report</b>				
<b>FY19 Budget vs. FY18 Budget</b>				
	<b>FY18</b>	<b>FY19</b>	<b>Variance</b>	<b>%</b>
	<b>Budget</b>	<b>Budget</b>		
<b>A. Revenues</b>				
<b>OWM Revenues</b>				
Hydro + Transmission	\$500,000	\$400,000	-\$100,000	-20.0%
Forestry	\$200,000	\$354,993	\$154,993	77.5%
Fishing & Recreation	\$240,000	\$230,000	-\$10,000	-4.2%
Misc.	\$50,000	\$30,000	-\$20,000	-40.0%
<b>OWM Revenues Subtotal</b>	<b>\$990,000</b>	<b>\$1,014,993</b>	<b>\$24,993</b>	<b>2.5%</b>
<b>MWRA Payments to Trust</b>	\$16,724,006	\$17,906,427	\$1,182,421	7.1%
<b>Total Revenues</b>	<b>\$17,714,006</b>	<b>\$18,921,420</b>	<b>\$1,207,414</b>	<b>9.6%</b>
<b>B. Expenditures</b>				
AA Personnel	\$10,225,408	\$10,734,300	\$508,892	5.0%
BB Employee Expenses	\$11,150	\$11,150	\$0	0.0%
CC Contracted Services	\$77,000	\$60,000	-\$17,000	-22.1%
DD Pensions/Insurance	\$3,723,748	\$3,964,970	\$241,222	6.5%
EE Admin Expenses	\$100,000	\$110,000	\$10,000	10.0%
FF Facility Operational Supplies	\$148,200	\$198,000	\$49,800	33.6%
GG Energy Costs	\$336,000	\$291,500	-\$44,500	-13.2%
HH Consultant Contracts	\$231,000	\$231,000	\$0	0.0%
JJ Operational Services	\$44,000	\$50,000	\$6,000	13.6%
KK Equipment	\$518,000	\$525,000	\$7,000	1.4%
LL Leases, Rentals	\$127,000	\$129,500	\$2,500	2.0%
NN Construction Improvements	\$795,000	\$675,000	-\$120,000	-15.1%
PP Grants to Public Entities	\$0	\$0	\$0	0.0%
TT Specials Payments	\$125,000	\$130,000	\$5,000	4.0%
UU IT Expenses	\$202,500	\$211,000	\$8,500	4.2%
<b>Total Baseline Costs</b>	<b>\$16,664,006</b>	<b>\$17,321,420</b>	<b>\$657,414</b>	<b>3.9%</b>
Wachusett/Sudbury Capital Projects	\$900,000	\$1,100,000	\$200,000	22.2%
Quabbin/Ware Capital Projects	\$150,000	\$500,000	\$350,000	233.3%
<b>Total Capital Projects</b>	<b>\$1,050,000</b>	<b>\$1,600,000</b>	<b>\$550,000</b>	<b>52.4%</b>
<b>Total Expenditures</b>	<b>\$17,714,006</b>	<b>\$18,921,420</b>	<b>\$1,207,414</b>	<b>6.8%</b>

APPENDIX H



## **APPENDIX I – MWRA Reserve Summary**

### **MWRA Rate Stabilization, Bond Redemption, and Funded Reserves (Updated based on June 30, 2018 Year End)**

Under the terms of its General Bond Resolution, MWRA maintains two funds, Rate Stabilization and Bond Redemption, which are used to smooth rate increases. Monies in the funds come from year-end CEB surpluses. The amounts in the funds and the permitted and planned uses are discussed below. Amounts reflect FY18 year-end transfers.

*Rate Stabilization - \$43.0 million.* Under the terms of the General Bond Resolution, the annual use of Rate Stabilization monies cannot exceed 10% of the year's senior debt service. As part of the FY18 CEB, \$6.5 million was allocated to help mitigate the rate impact of the new cross harbor cable to DITP. Those funds were deposited into rate stabilization. The FY15 through FY19 Final CEB did not include the use of Rate Stabilization Funds. Planning estimates based on the FY19 Budget assume no use of Rate Stabilization monies through the planning period ending with FY28.

*Bond Redemption - \$26.1 million.* Monies in the Bond Redemption Fund can be used only to retire or prepay outstanding debt. There is no annual limit on the amount of Bond Redemption funds used in a year. However, there are constraints based on bond maturity dates. The FY15 Final CEB included the use of \$6.7 million of bond redemption funds. The FY16, through FY19 CEB assumed no use of Bond Redemption. Planning estimates assume the use of \$23.5 million of funds in FY26 and no other withdrawals during the planning period which ends in FY28.

In addition to the Rate Stabilization and Bond Redemption funds, MWRA maintains five funded reserves required by the terms of the General Bond Resolution: Debt Service, Operating, Insurance, and Renewal and Replacement. The amount in each reserve, the basis for determining the funding requirement and when a reserve can be used to reduce rate revenue requirements are discussed on the right:

*Debt Service Reserve - \$155.1 million.* This is MWRA's largest reserve, and is funded from bond proceeds. This balance reflects the withdrawal of \$5.9 million as part of the 2014 Series D-F transaction. On August 4, 2015, MWRA released \$67.0 million from the debt service reserve fund as part of the amendments to the General Bond Resolution. On May 16, 2018, MWRA deposited \$4.8 million into the debt service result fund as part of the 2018 Series B and C transaction. The required balance is equal to the sum of the average annual debt service for outstanding issues. The fund can be used to pay debt service when the amount for a specific debt series in the reserve is greater than the remaining debt service.

*Operating Reserve - \$40.3 million.* The required balance is one-sixth of operating expenses for a year. Based on the FY18 Final CEB, the required balance is \$40.3 million. The balance is projected to be \$42.1 million by the end of FY19.

*Insurance Reserve - \$14.0 million.* MWRA mitigates the budgetary risk of self-insurance by maintaining an insurance reserve. The reserve which was established as part of the Bond Resolution requires that an independent insurance consultant review the adequacy of the funding level every three years. The \$14 million level has been determined to be acceptable and reasonable based on the February 2014. A review of this reserve was completed in 2017.

*Renewal and Replacement Reserve - \$10.0 million.* The required balance is set at \$10 million with the difference between the \$10 million and the required balance based on the triennial recommendation of a consulting engineer being available in short-term borrowing capacity. The current recommendation is \$35 million. MWRA's consulting engineer will complete its triennial review of this reserve balance again in 2017.

#### **CORE Fund**

The CORE Fund was eliminated as part of the amendment to the General Bond Resolution.



## APPENDIX J

### GLOSSARY OF FINANCIAL AND OPERATING TERMS

**8M permit:** Permission granted by MWRA to persons who wish to construct property improvements on land either adjoining or overlapping MWRA property interests. Permission may be conditioned on various operational and/or engineering concerns.

**Accrued Costs:** Adjustments to paid expenditures to account for materials or services received but for which payment has not yet been made.

**Activated Sludge:** The sludge that results when primary effluent is mixed with bacteria-laden sludge and then agitated and aerated to promote biological treatment.

**Advanced Waste Treatment:** Wastewater treatment beyond the secondary or biological stage that includes the removal of nutrients such as phosphorus and nitrogen and the removal of a higher percentage of suspended solids and organic matter than primary treatment.

**Advisory Board:** The agency that represents the interests of MWRA's 61 user communities to the Board of Directors in an advisory capacity in accordance with the provisions of MWRA's Enabling Act. The Advisory Board elects three members of the Board of Directors, reviews and comments on MWRA's CIP and CEB, and approves the addition of new communities to the wastewater and water systems.

**Aerobic:** In the presence of free oxygen.

**Anaerobic:** Life or processes such as bacteria that digest sludge that require, or are not destroyed by, the absence of free oxygen.

**AOC:** Assimilable Organic Carbon - One measure of the "food" available to bacteria within a water system. More complex carbon compounds can become assimilable when oxidized by strong disinfectants.

**ARRA:** American Recovery and Reinvestment Act of 2009 – principal forgiveness loans distributed based on the Department of Environmental Protection's Intended Use Plan.

**Ash:** The inert material remaining after the combustion of wastewater sludge. Ash is either wet or dry depending on combustion system design.

**Audit:** An independent examination of the financial books and records of the organization. Typically, audit refers to the year-end examination and preparation of audited financial statements performed by an outside accounting firm hired under contract.

**Bacteria:** One-celled microscopic organisms commonly found in the environment. Bacteria can be harmful, such as pathogens, or helpful and perform a variety of biological treatment processes.

**BDOC:** Biologically Degradable Organic Carbon - Another, more precise, measure of the “food” available to bacteria within a water system.

**BGD:** Billion gallons per day.

**Biofilm:** Growth of various bacteria within a water distribution system on the pipe walls. Biofilm growth can contribute to iron corrosion, colored water, poor taste, excessive chlorine demand, and complications with coliform testing.

**Blow-off valves:** Valves operated during pipeline repair to de-water (drain) a portion of a pipeline.

**BOD:** Biochemical Oxygen Demand - An indicator of the amount of biodegradable contaminants in wastewater.

**Board of Directors:** The 11-member governing board of MWRA.

**Bond:** A general debt obligation. Typically, bonds are issued as a series of bonds of different amounts and interest rates maturing in different years.

**Bond Resolution:** A document adopted by the Board of Directors that governs MWRA's issuance of revenue bonds and sets forth its obligations to bondholders.

**Boston Harbor Project:** An extensive plan of activities which MWRA developed and implemented to construct new wastewater treatment facilities in response to a federal court order to comply with the provisions of the U.S. Clean Water Act.

**Business Systems Plan (BSP):** The strategic planning framework for MWRA’s management information systems. The BSP is updated annually to reflect ongoing business requirements, new opportunities identified by ongoing MWRA strategic planning efforts, technology changes, and user requests.

**BWSC:** Boston Water and Sewer Commission - The agency responsible for providing water and sewer services to the City of Boston, MWRA’s largest customer.

**BWTF:** William A. Brutsch Water Treatment Facility – Water treatment plant for the Chicopee Valley Aqueduct communities of Chicopee, South Hadley Fire District #1, and Wilbraham. The facility has a capacity of 24 mgd, and disinfects the water using a combination of UV light and chlorine.

**CADD:** Computer aided drafting and design.

**Capital Improvement Program (CIP):** A plan which identifies and estimates the nature, schedule, cost, and financing of long-term assets that MWRA intends to build or acquire during a specific period.

**Capital Investment:** Development of a facility or other asset that adds to the long-term value of an organization.

**Carroll Water Treatment Plant (CWTP):** Water treatment facility for waters from Quabbin and Wachusett Reservoirs with capacity of 405 mgd using ozonation as a primary disinfectant and UV as a secondary disinfectant beginning in February 2014.

**CCR:** Consumer Confidence Report – The 1996 Amendments to the Safe Drinking Water Act required public water suppliers to provide all consumers with an annual Consumer Confidence Report by July 1, 2005. The report includes water quality information and education for the consumer about their publicly supplied drinking water.

**CDF:** Cosgrove Disinfection Facility

**Cathodic Protection:** A form of corrosion protection that is particularly effective against galvanic corrosion. Galvanic corrosion occurs when pipe metal is in the presence of other metals while immersed in water. The interaction of these elements causes an electric current to flow away from the pipe, taking electrons with it and pitting the pipe as a result. Cathodic protection reverses the current, thereby stopping the corrosion.

**Centrifuge:** A machine that uses centrifugal force to separate substances of different densities and remove moisture. MWRA uses centrifuges at the Deer Island Wastewater Treatment Plant to de-water sludge.

**CFM:** Cubic Feet per Minute - A measure of the quantity of a material flowing through a pipe.

**Chloramination:** The process of adding chloramine to drinking water. Chloramine, a form of chlorine and ammonia, is used as a residual disinfectant because it lasts longer in the water distribution system than primary disinfectants.

**Chloramine:** A long lasting residual disinfectant created by combining measured amounts of chlorine and ammonia. Chloramine forms fewer disinfection by-products than chlorine.

**Chlorination:** The process of adding chlorine to drinking water to inactivate pathogens.

**Chlorine:** A relatively strong primary disinfectant, effective against bacteria, *giardia*, and viruses, but not *cryptosporidium*. Concerns exist about the health effects of its by-products, some of which are or will be regulated.

**Clarifiers:** Settling tanks or basins in which wastewater is held for a period of time, during which heavier solids settle to the bottom and lighter materials float to the surface.

**Clean Water Act:** A law passed by Congress in 1972, and subsequently amended, which sets national standards for pollution reduction, permits discharges from wastewater treatment plants, and promotes achievement of the national goal that all surface waters be "fishable and swimmable."

**Cleaning and Lining:** Cleaning and cement lining of unlined cast iron water mains to improve hydraulic capacity and extend useful life.

**CMMS (Computerized Maintenance Management System):** *Maximo* is the computerized maintenance management system which is an essential component of successful asset management. This system is an important tool used in refining the long-term maintenance strategy to ensure proper maintenance and replacement of plant assets.

**Co-Digestion Process:** Introduction of non-wastewater derived organic waste material into the wastewater anaerobic digestion process. Co-digestion could potentially increase digester gas production which would be utilized for heating and electricity generation at Deer Island.

**Coliform bacteria:** A group of lactose fermenting bacteria, which while not of direct health concern, are used as a first line indicator of potential problems. See fecal coliform and *E.coli*.

**Combined Sewer and Combined Sewer Overflow:** While modern systems transport rainwater and sewage from homes and businesses through separate pipes, some older systems like Boston's have "combined" sewers that carry both flows together. During normal conditions flows are delivered to treatment plants. During very heavy rains, these systems become overloaded. Built-in overflows (called combined sewer overflows or "CSOs") must then act as relief points by releasing excess flows into the nearest body of water. This prevents sewage backups into homes and onto area streets, but the discharges can impact water quality.

**Comminutor** - A machine or process that pulverizes and reduces solids to minute particles.

**Commonwealth Debt Service Assistance (DSA):** Funds appropriated by the Commonwealth to offset MWRA capital financing expenses.

**Community Obligation and Revenue Enhancement (CORE) Fund:** A fund established by MWRA's bond resolution that is used to provide insurance against delays by communities in paying charges due to MWRA.

**Composting:** The process of converting wastewater treatment residuals to a soil-like humus material often used in the horticultural industry. The process involves the aerobic breakdown of the residuals and the addition of sawdust or wood chips.

**Corrosion Control:** Adjustments to the chemistry of treated water to reduce its ability to dissolve lead, copper, other metals, or form hydrogen sulfide. Corrosion control can include adjustments to pH and alkalinity, as well as the addition of corrosion inhibitors such as phosphates or oxidizers.

**Coverage Requirement:** Requirement of MWRA's bond resolution which provides that each year, revenue less operating expenses (net revenue) must be more than the amount required for debt service payments on outstanding bonds.

**CP (Construction Package):** Major construction projects such as the Carroll Water Treatment Plant or the North Dorchester Bay CSO project will group areas of work into individual construction contracts.

**Cross-Connection:** A point at which potable water piping is connected to a non-potable water source creating an opportunity for the introduction of pollutants into the potable water.

**Cryogenic oxygen plant:** MWRA operates a cryogenic oxygen-based facility as part of its secondary wastewater treatment program at Deer Island.

**Cryptosporidium:** A protozoan parasite that can cause severe gastrointestinal disease in healthy individuals, and may be fatal to people with compromised immune systems. Cryptosporidia exist in the environment as hard walled oocysts that are very resistant to chlorination, but can be inactivated by disinfection with ozone or ultraviolet light.

**CSO:** Combined Sewer Overflow – An overflow point and the discharged flow from a combined sewer system intended to provide hydraulic relief to avoid system flooding and backups during large wet weather events. During large rainstorms, systems can become overloaded, with the excess discharged directly into surface waters. The discharged flow and the discharge location are called CSOs. In the metropolitan Boston area there are approximately 46 active, permitted CSOs that currently discharge into rivers or Boston Harbor.

**CSO Facilities:** MWRA has six facilities that intercept the flow from CSO pipes. Four of these facilities provide treatment and two provide storage prior to discharge. The CSO facilities have some capacity to store flow and pump it to the Deer Island plant after rainstorms end.

**CT:** Concentration x Contact Time - A measure of disinfection effectiveness established under the Surface Water Treatment Rule. CT is the product of the concentration of disinfectant [C] and the time it has been in contact with the water [T]. Required CT varies by type of disinfectant, organism, temperature, and pH.

**CTG (Combustion Turbine Generator):** CTGs are used to generate electricity during planned cable outages, wet weather operations and for participation in price response events.

**Current Expense Budget:** A financial plan that estimates the revenues and expenses associated with MWRA's operations for a fiscal year.

**C-Value:** The carrying capacity of a water main for a specified length and pressure drop that is determined by its diameter and resistance to flow. The friction coefficient "C" of the main is often used as a measure of flow resistance. C-values for new pipe are about 120 for water mains that are 6 to 16-inches in diameter, and 130 and 140 for larger diameter mains.

**DAF:** Dissolved Air Flotation - A process of adding super saturated air into water to cause coagulated solids to rise to the top to be skimmed off. DAF replaces conventional gravity sedimentation (clarification) and is particularly cost-effective for low turbidity waters subject to periodic algae blooms.

**DBP:** Disinfection By-products - Complex compounds formed by the use of oxidizing agents such as chlorine or ozone in waters containing organic matter.

**D/DBP Stage 1:** Disinfectants/Disinfection By-products, Stage 1 Rule - Promulgated 11/1998, and effective 1/2002, this rule set DBP limits at 80 parts per billion for Trihalomethanes and 60 parts per billion for Haloacetic Acids, averaging all samples over four quarters.

**D/DBP Stage 2:** Disinfectants/Disinfection By-products Stage 2 Rule - The rule further regulates the amount of DBPs allowed in water. The 80/60 values set in Stage 1 will now apply to each individual sample location in a "Locational Running Annual Average".

**Debt Service:** In a given fiscal year, the amount of money necessary to pay interest and principal on outstanding notes and revenue bonds.

**Defeasance:** The setting aside of cash or securities sufficient to make debt service payments allowing the reduction of the debt amount to the liabilities of a balance sheet and the reduction of the debt service amount to the Current Expense Budget.

**DEP:** Department of Environmental Protection - The Massachusetts agency that regulates water pollution control, water supplies, and waterways and dispenses federal and state grant funds to support these activities.

**Department:** A sub-unit of an MWRA division.

**Department of Conservation and Recreation (DCR):** Created in 2003 through the merger of the Metropolitan District Commission and the Department of Environmental Management, DCR manages the Commonwealth's diverse parks system and protects and enhances natural resources and outdoor recreational opportunities throughout Massachusetts.

**De-watering:** The process of removing water from wastewater treatment residuals. De-watered sludge has the appearance of mud or wet soil material.

**Diffusers:** A system of shafts, rising from the end of MWRA's effluent outfall tunnel to the seabed, which disperses treated wastewater over a large area. Technically, the diffusers are the "sprinkler heads" mounted on top of the riser shafts that lead from the outfall tunnel and disperse wastewater into Massachusetts Bay.

**Digesters:** Tanks for the storage and anaerobic or aerobic decomposition of organic matter present in sludge.

**Direct Program Expenses:** Costs directly associated with providing services or performing activities.

**Disinfection, Primary:** The inactivation (killing) of pathogenic organisms in a water system by the use of chemical or other disinfection agents.

**Disinfection, Residual:** The presence of a measurable residual of disinfectant within a water distribution system to help control bacterial re-growth and guard against contamination.

**Dissolved Oxygen (DO):** A measure of the amount of oxygen in a given amount of water. Adequate levels of DO are needed to support aquatic life. Low dissolved oxygen concentrations can result from inadequate wastewater treatment.

**Division:** A major organizational unit within MWRA, encompassing the activities and resources for providing a major service or function.

**DLS (Department of Laboratory Services):** Laboratory Services is a full service analytical testing and consulting group within the MWRA that primarily serves client groups primarily within the Operations Division. The analytical services that Laboratory Services provides include wet chemistry, metals, organics, and microbiology testing. Related services include field sampling, technical consultation, and contract laboratory management.

**DMR (Discharge Monitoring Report):** Monthly reports that are submitted to federal and state regulators. MWRA monitors the effluent (treated sewage) that is discharged into Massachusetts Bay, to ensure that it meets the standards set out in the NPDES permit. Analytical support to the effluent monitoring program is provided by the Department of Laboratory Services.

**E.coli:** A normal inhabitant of the digestive tract of mammals. The presence of *E.coli* indicates probable contamination by fecal matter.

**Effluent:** Treated wastewater discharged from a treatment plant.

**EIR:** Environmental Impact Report – A document prepared in adherence with the Massachusetts Environmental Policy Act (MEPA) to review the environmental impact of projects and ensure opportunities for public review and comment.

**EIS:** Environmental Impact Statement – A document prepared in adherence with the National Environmental Policy Act to review the environmental impact of projects and ensure opportunities for public review and comment.

**Enabling Act:** Legislation (Chapter 372 of the Acts of 1984) that established MWRA and define its purpose and authority as of January 1, 1985.

**ENF:** Environmental Notification Form - The first step in the MEPA process.

**EOEEA:** Executive Office of Energy and Environmental Affairs - The Massachusetts cabinet office that oversees state environmental agencies.

**EOC:** Emergency Operations Center

**EOEA:** Executive Office of Environmental Affairs - The Massachusetts cabinet office that oversees state environmental agencies.

**EPA:** Environmental Protection Agency - The federal government agency responsible for environmental enforcement and investigation.

**ESWTR:** Enhanced Surface Water Treatment Rule - A federal rule that is promulgated in three stages:

1) Interim Enhanced Surface Water Treatment Rule (IESWTR): The IESWTR was promulgated in 1998 and tightened the requirements for the operation of water filtration plants in large systems to take a first step toward controlling *cryptosporidium* in source waters. IESWTR also added *cryptosporidium* to the list of issues considered within watershed protection plans for unfiltered systems.

2) LT1ESWTR primarily extends the IESWTR to smaller systems

3) LT2ESWTR: further tightens the standards for the operation of filtration plants and adds requirements for 99% inactivation of *cryptosporidium* and the use of two primary disinfectants for unfiltered systems. The concept of proportional treatment, with less treatment required for cleaner sources, was implemented as part of the rule.

**Enterococcus:** A pathogen indicator, similar to fecal coliform, that is used in the Massachusetts Water Quality Standards for marine waters, consistent with the Federal Clean Water Act requirements, which indicates potential contamination from human or animal waste.

**Enterprise Fund:** A governmental accounting and budgeting Fund that is designed to be self-supporting with revenues equal to expenditures.

**Eutrophication:** Nutrient enrichment of a lake or other water body typically characterized by increased growth of planktonic algae and rooted plants. Eutrophication can be accelerated by wastewater discharges and polluted runoff.

**Eversource:** Formerly NStar, formerly Boston Edison Company, is a publicly traded, Fortune 500 energy company headquartered in Hartford, Connecticut and Boston, Massachusetts, with several regulated subsidiaries offering retail electricity and natural gas service to more than 3.6 million customers in Connecticut, Massachusetts and New Hampshire.

**Expenditures:** Payments for goods and services received.

**Expenses:** Costs associated with the operating activities of a period, including expenditures and accrued costs.

**Facility Information System (FIS):** The management information system at the Deer Island Treatment Plant.

**Fecal coliform bacteria:** A group of bacteria used as a primary indicator organism for potential contamination from human or animal waste. Also called thermo-tolerant bacteria. Specific organisms in the group may or may not be of health concern (see *E.coli*).

**Filtration:** A water treatment process involving the removal of suspended particulate matter by passing the water through a porous medium such as sand or carbon.

**Fiscal Year:** The 12-month financial period used by MWRA that begins July 1 and ends June 30 of the following calendar year. MWRA's fiscal year is numbered according to the calendar year in which it ends.

**Flash coat:** A light coat of shotcrete used to cover minor blemishes on a concrete surface.

**FOD (Field Operations Department):** Department within the Operations Division created to provide high quality, uninterrupted water delivery and wastewater collection services to MWRA communities. The department is responsible for the treatment, transmission, and distribution of water from the Quabbin and Wachusett reservoirs to community water systems. It also manages the collection, transport, and screening of wastewater flow from MWRA communities to the Deer Island Treatment Plant.

**Force Main:** A pressure pipe joining the pump discharge at a water or wastewater pumping station with a point of gravity flow.

**FRSA (Fore River Staging Area):** The site of the Sludge Pelletization Plant.

**FTE (Full Time Equivalent):** An FTE is the hours worked by one employee on a full-time basis. The concept is used to convert the hours worked by several part-time employees into the hours worked by full-time employees.

**Fund:** A separate accounting entity for a particular purpose facilitating the accounting of assets, liabilities, and net assets.

**Giardia:** A protozoan parasite that can cause severe gastrointestinal disease, although there is medical treatment available. *Giardia* exist in the environment as hard-walled cysts, and are moderately resistant to chlorine disinfection.

**Geographic Information System (GIS) --** A geographic information system is a system designed to capture, store, manipulate, analyze, manage, and present all types of spatial or geographical data.

**Green Energy:** Energy that comes from natural sources such as sunlight, wind, rain, tides, plants, algae and geothermal heat. These energy resources are renewable, meaning they're naturally replenished.

**Goal:** A statement in general terms of a desired condition, state of affairs, or situation. Goals, which are long-term in nature and not usually directly measurable, provide general direction for the activities of operating units.

**Global Positioning System (GPS):** Also known as an Automatic Vehicle Location system (GPS/AVL), this tool provides real-time transmission alerts utilizing a cell phone/satellite communication system and a web-based mapping system to track vehicles and operator-driven mobile equipment in MWRA's service area. The system allows MWRA to respond more quickly to emergencies, enhance driver and vehicle safety, reduce fuel costs, track mileage electronically, monitor unauthorized vehicle usage, and improve efficiency.

**Graphitization:** A corrosion mechanism that alters the molecular structure of the carbon/iron matrix of cast iron pipe. During the process, iron atoms are forced away from the metal leaving behind an unstable carbon matrix. The result is a weakened pipe, easily susceptible to ruptures. High frequency in the number of breaks causes leakage to be a major problem of graphitized pipe.

**Grit:** Sand-like materials that quickly settle out of wastewater.

**Groundwater:** A body of water beneath the surface of the ground. Groundwater is made up primarily of water that has seeped down from the surface.

**HAA:** Haloacetic Acids - A class of disinfection by-products related to chlorine disinfection. HAAs are regulated under D/DBP Stage 1 and 2 Rules at 60 ppb.

**Harbor Electric Energy Company (HEEC):** A subsidiary of Eversource which installed a cross harbor power cable and built a sub-station to provide power for construction and operation of the Deer Island Wastewater Treatment Plant.

**Head House:** A structure containing the control gates to a conduit such as a sewer pipeline.

**Headworks:** A preliminary treatment structure or device, usually including a screening and de-gritting operation, that removes large or heavy materials such as logs and sand from wastewater prior to primary treatment.

**Heavy Metals:** Metals such as lead, silver, gold, mercury, bismuth, and copper that can be precipitated by hydrogen sulfide in an acid solution.

**HOM (Harbor and Outfall Monitoring):** A comprehensive program to provide environmental data that helps to predict and measure the effect of Deer Island outfall discharge on the marine ecosystem.

**Incentives and Other Charges:** A fee system designed to help recover permitting, inspecting, and monitoring costs incurred by MWRA's TRAC Program and provide incentives to permitted users to reduce discharges.

**Indirect Expenses:** Costs not directly associated with providing services or performing activities.

**Infiltration/Inflow (I/I):** The problem of clean water flows entering sewers resulting in diminished pipe capacity for sanitary flows and in costly pumping and treatment of unnecessarily large wastewater volumes. Infiltration is groundwater that leaks into the sewerage system through pipe joints and defects. Inflow, primarily a wet-weather phenomenon, refers to water that enters sewers from improperly connected catch basins, sump pumps, land and basement drains, and defective manholes. Inflow also enters through improperly closed or defective tidegates during high tides.

**Influent:** The flow of water that enters the wastewater treatment process.

**Insurance Reserve:** A fund established to adequately reserve against risks for which MWRA does not currently maintain insurance.

**Interceptors:** The large pipes that convey wastewater from collection systems to treatment plants.

**Investment Income:** Income derived by investing certain operating and reserve fund balances in interest-yielding securities in accordance with the provisions of MWRA's bond resolution.

**ISO - NE (Independent System Operator of New England):** Non-profit wholesale operator of the regional grid system. The MWRA receives payment from ISO-NE when Deer Island, Carroll Water Treatment Plant, and the four Remote Headworks remove themselves from the grid. All six facilities participate in load response programs offered by ISO-NE which pays larger commercial and industrial electricity consumers to “shed load” during grid peaks. There are several programs available such as price, demand response and load response. MWRA constantly evaluates the options and participates in the most advantageous program.

**Labor Costs:** Direct costs of employing permanent and temporary personnel, including wages, salaries, overtime pay, fringe benefits, and workers' compensation.

**Land Application:** The use of wastewater treatment residuals on land for agricultural benefits.

**Landfilling:** The disposal of residuals by burial. Modern landfills have double liners, leachate collection systems, and other design features to protect against groundwater contamination.

**LCR:** Lead and Copper Rule – A federal rule that set an action level for lead and copper at “worst case” consumer taps. Optimized corrosion control, notification, education, and lead service replacements are all components of compliance plans.

**Leachate:** Water that drains from a landfill after having been in contact with, and potentially contaminated by, buried residuals. Modern landfills are designed to collect leachate for subsequent treatment.

**Limnology:** The scientific study of physical, chemical, meteorological, and biological conditions in fresh waters.

**LIMS:** Laboratory Information and Management System – An automated database system used to transfer information between MWRA’s Central Laboratory to its client groups and to process information obtained by the Central Laboratory to monitor substances that enter and leave the MWRA wastewater system. Use of LIMS removes the potential for human error in the sampling process by bar coding samples, eliminating the need to transcribe sample data, producing pre-printed project-specific sample check-off forms for field crews, and automating testing through pre-set test codes and project-specific parameters.

**LOX (Liquid Oxygen):** Liquid oxygen is used together with electrical energy to generate ozone at the Carroll Water Treatment Plant.

**Mapping Protocols:** Sets of specifications defining the content and format of data to be collected.

**MCL:** Maximum Contaminant Level - The highest level of a contaminant that is allowed in drinking water. MCLs are set as close to MCLGs as feasible using the best available control technology.

**MCLG:** Maximum Contaminant Level Goal - The level of a contaminant in drinking water below which there is no known or expected risk to health. MCLGs allow for a margin of safety.

**Massachusetts Environmental Policy Act (MEPA) Unit:** A unit of the Commonwealth’s Executive Office of Environmental Affairs responsible for implementation of the state environmental review process.

**Methane:** A colorless, nonpoisonous, flammable gas produced as a by-product of anaerobic sludge processing. At Deer Island, MWRA uses methane as fuel to provide heat and hot water and to generate electricity.

**MGD:** Million gallons per day.

**MIS:** Management Information Systems

**Mission:** A description of the fundamental purposes and major activities of an operating unit or program.

**Mitigation:** Financial remuneration or non-financial considerations that MWRA provides to communities to alleviate the negative effects of major construction projects.

**Molybdenum (Mo):** A metallic element that resembles chromium and tungsten in many properties, and is used in strengthening and hardening steel. Mo is a trace element in plant and animal metabolism. The concentration of molybdenum in sludge products is strictly regulated.

**NACWA (Nation Association of Clean Water Agencies):** NACWA represents the interests of publicly owned wastewater treatment plants. NACWA is involved in all areas of water quality protection including the development of environmental legislation and assisting federal regulatory agencies in the implementation of environmental programs.

**NEFCo:** New England Fertilizer Company - The contractor responsible for the operation of processing sludge into fertilizer pellets at MWRA's residuals processing plant located in Quincy. NEFCo is also responsible for marketing and distributing the pellets and disposing of any product that is not marketable.

**National Pollutant Discharge Elimination System (NPDES) Permit:** A permit issued by EPA in conjunction with DEP that governs wastewater discharges into surface waters.

**NHS (Northern High Service):** Project that involves a series of water system pipeline improvements in the MWRA's Northern High Service Area.

**Nitrification:** An aerobic process in which bacteria changes the ammonia and organic nitrogen in wastewater into oxidized nitrogen (usually nitrate). Second-stage BOD is sometimes referred to as the nitrification stage (first-stage BOD is called the carbonaceous stage). Also, a similar process in the water distribution system, where ammonia from chloramine can be used by nitrifying bacteria, resulting in a reduced chlorine residual, and the potential for additional bacteria growth.

**OCC:** Metropolitan Operations Control Center, located at MWRA's Chelsea Facility.

**OEP (Office of Emergency Preparedness):** The Office of Emergency Preparedness has oversight over security, exercises, emergency operations, planning, the Emergency Services Unit and critical infrastructure protection.

**OMS (Operations Management Systems):** OMS correlates PICS data with laboratory analysis to track and analyze DITP's process performance with regard to the plant's discharge permit from EPA and DEP and with respect to cost effective operation.

**Operating Reserve:** A fund established to adequately reserve for operating contingencies, required by MWRA's bond resolution to be not less than one-sixth of its annual operating expenses.

**Organic Matter:** Material containing carbon, the cornerstone of plant and animal life. It originates from domestic and industrial sources.

**Other User Charges:** Revenue received per agreements MWRA has for provision of water, sewer, and other services to entities other than communities which are charged assessments.

**Outfall:** The pipe or structure where effluent is discharged into receiving waters.

**Ozonation:** The application of ozone to water, wastewater, or air, generally for the purposes of disinfection or odor control. The Carroll Water Treatment Plant (CWTP) employs the ozonation process to inactivate pathogens, including *cryptosporidium*, with lower levels of DBPs.

**Ozone:** A strong disinfectant made from oxygen and electrical energy. Ozone is effective against *cryptosporidium*.

**Pathogens:** Harmful organisms, often called germs that can cause disease. Waterborne pathogens (or the diseases they cause) include *giardia*, *cryptosporidium*, cholera, typhoid, *E.coli*, Hepatitis A, *legionella*, and MAC.

**Payments in Lieu of Taxes (PILOT):** Amounts which MWRA pays each fiscal year to cities and towns for land owned by the Commonwealth in the Quabbin, Ware River, Wachusett, and Sudbury watersheds. Consistent with the provisions of MWRA's Enabling Act, these payments are based on the past commitments of the Commonwealth of Massachusetts.

**Penalty Revenue:** Revenue derived from penalties assessed by MWRA to violators of its sewer use regulations.

**Performance Measure:** An indicator of the work and/or service provided, defined by output, work or service quality, efficiency, effectiveness, or productivity.

**Performance Objective:** A statement of proposed accomplishments or attainments that is short-term in nature and measurable.

**PICS (Process Instrumentation and Control System):** PICS provides real-time operations data from systems throughout Deer Island (including system status, flow, etc.).

**PILOT (Payment in Lieu of Taxes):** The Watershed PILOT program is the method that DCR compensates communities which contain the state owned land bought to protect one of the nation's largest unfiltered water supply systems. The law that defines this PILOT program, MGL c. 59 s.5G, guarantees regular and stable payment to 29 Massachusetts communities.

**Plume:** The rising discharge of treated wastewater effluent from a treatment plant outfall pipe.

**Preliminary Treatment:** The process of removing large solid objects, sticks, gravel, and grit from wastewater.

**Pretreatment:** The reduction or elimination of pollutant properties in wastewater prior to discharge into a sewer system.

**Primacy:** Primary enforcement authority for Federal Safe Drinking Water Act regulations delegated to a state by the Environmental Protection Agency (EPA).

**Primary Treatment:** A wastewater treatment process that takes place in a rectangular or circular tank and allows substances in wastewater that readily settle or float to be separated from the water being treated. Primary treatment results in 50-60% removal of suspended solids and 30-34% removal of BOD.

**Program:** An organized group of activities and the resources to carry them out aimed at achieving one or more related objectives.

**Rate Revenue:** Revenue received from annual assessments of communities within MWRA's service area for water and sewer services.

**Rate Stabilization Reserve:** A fund established by the Board of Directors that is used to reduce rate revenue requirements. MWRA finances this reserve with unexpended or surplus funds available from the Current Expense Budget at the end of each fiscal year.

**RCM (Reliability Centered Maintenance):** A maintenance strategy adopted at Deer Island in FY00 for critical systems. RCM is a failure modes and effects process that involves maintenance, operations and engineering staff in the development of preventative maintenance and operation plans for plant systems.

**Relief Sewer:** A sewer built to carry flows in excess of the capacity of an existing sewer.

**Renewable Energy:** Energy from a source that is not depleted when used, such as wind or solar power

**RGGI:** The Regional Greenhouse Gas Initiative is a mandatory, market-based program in the United States to reduce greenhouse gas emissions. The program involves selling emission allowances through auctions and investing the proceeds in demand-side management and clean energy technology projects.

**Remote Headworks:** The initial structures and devices of a treatment plant set apart by some distance from the plant site.

**Renewal and Replacement Reserve:** A fund established to adequately reserve for the cost of capital improvements not provided for by funds available through the Capital Improvement Program or the Current Expense Budget.

**Residuals:** The by-products of the wastewater treatment process, including scum (floatables), grit and screenings, primary sludge, and secondary sludge.

**Revenue Bonds:** Bonds payable from a specific source of revenue and which do not pledge the full faith and credit of the issuer.

**RPS (Renewable Portfolio Standards):** State policies which mandate a state to generate a percent of its electricity from renewable resources. Qualified renewable generation facilities for the MWRA include: the Steam Turbine Generator (STG) and a variety of Hydroelectric, Wind and Solar units. The MWRA is issued electronic certificates for each megawatt hour of electricity produced from the digester gas, which is considered renewable energy. RPS credits are a source of revenue for the MWRA.

**Safe Yield Model:** The equation used to determine the maximum dependable draft that can be made continuously on a water supply source during a period of years during which the probable driest period or period of greatest deficiency in water supply is likely to occur.

**SAMS:** Sewerage Analysis and Management System – A database which contains specifications of the location, size, and condition of MWRA wastewater interceptors and appurtenances and which produces maps for use by MWRA and outside parties. Now referred to as Wastewater GIS.

**Sanitary Sewers:** In a separate system, pipes that carry only domestic wastewater.

**SCADA:** Supervisory Control and Data Acquisition - Equipment for monitoring and controlling water or wastewater facilities remotely.

**SCBA:** Self-contained breathing apparatus.

**Screenings:** Large items such as wood and rags that are collected from wastewater in coarse screens prior to primary treatment.

**Scum:** Floatable materials such as grease, oil, and plastics that are skimmed from the surface of wastewater as it flows through large settling tanks.

**SDWA:** Safe Drinking Water Act - A Federal law enacted in 1986 and amended in 1996 that requires EPA to establish national primary drinking water regulations for water suppliers which consist of MCLs or treatment techniques.

**Secondary Treatment:** Usually following primary treatment, secondary treatment employs microorganisms to reduce the level of BOD and suspended solids in wastewater.

**Sedimentation Tanks:** Settling tanks where solids are removed from sewage. Wastewater is pumped to the tanks where the solids settle to the bottom or float on the top as scum. The scum is skimmed off the top, and solids on the bottom are pumped out for further treatment and/or final disposal.

**Seeding:** The initial filling of sludge into digesters.

**Sensitive user:** A member of a group within the general population likely to be at greater risk than the general population of adverse health effects due to exposure to contaminants in drinking water. Sensitive users include infants, children, pregnant women, the elderly, and individuals with histories of serious illness.

**Septic Tanks:** Tanks used for domestic wastes when a sewer line is not available to carry them to a treatment plant. Periodically, the septage is pumped out of the tanks, usually by commercial firms, and released into a wastewater treatment system.

**Shotcrete:** Mortar or concrete conveyed through a hose and projected at high velocity onto a surface; also known as air-blown mortar, pneumatically applied sprayed mortar, or gunned concrete.

**Siphon:** A closed conduit, a portion of which lies above the hydraulic grade line, resulting in a pressure less than atmospheric and requiring a vacuum within the conduit to start flow. A siphon utilizes atmospheric pressure to effect or increase the flow of water through the conduit.

**Slip Lining:** Insertion by pushing or pulling of lines fabricated of plastic, concrete cylinder pipe, reinforced concrete, or steel through existing conduits from access pits.

**Sludge:** Material removed by sedimentation during primary and secondary treatment. Sludge includes both settled particulate matter and microorganisms and is the single largest component of wastewater residuals. At the time sludge is removed during the treatment process, it contains only 0.5% to 5% solid content by weight. It has the appearance of muddy water.

**Sodium Hypochlorite (NaOCl):** A liquid form of chlorine that MWRA uses in the disinfection and/or odor processes at the Deer Island Treatment Plant, various other Wastewater facilities, and the Carroll Water Treatment Plant (CWTP).

**Storm Sewers:** Separate systems of pipes that carry only water runoffs from roofs, streets, and parking lots during storms.

**Surcharging:** Loads on a system beyond those normally anticipated; also, the height of wastewater in a sewer manhole above the crown of the sewer when the sewer is flowing completely full.

**Suspended Solids:** The particulate matter contained in wastewater.

**SWTR:** Surface Water Treatment Rule – A Federal rule promulgated in 1989 that affects all utilities using surface waters or waters under the influence of surface waters. SWTR requires filtration unless certain criteria on source water quality, watershed control, and disinfection effectiveness can be met (see also ESWTR).

**Telemetry:** Remote measuring or monitoring devices connected to a central monitoring station via telephone lines.

**TCR:** Total Coliform Rule – A federal rule that requires monitoring of water distribution systems for coliform bacteria and chlorine residual. No more than 5% of the coliform samples in a month can be positive.

**TOC:** Total Organic Carbon - A measure of the amount of organic material in water. Often used as a surrogate for disinfectant demand or DBP precursors.

**Transition:** A short section of conduit used as a conversion section to unite two conduits having different hydraulic elements.

**TTHM:** Total Trihalomethanes - A class of disinfection by-products, related to primarily chlorine disinfection (see D/DBP Rule).

**TRAC:** Toxic Reduction and Control – The department responsible for MWRA’s industrial pretreatment program.

**TSS (Total Suspended Solids):** A measure of the settleable solids and non-settleable solids in wastewater. During the primary treatment process, flows are routed to primary treatment clarifiers that remove about half of the pollutants brought to the plant in typical wastewater (50-60% of total suspended solids and up to 50% of pathogens and toxic contaminants are removed).

**Ultraviolet (UV) Treatment:** Ultraviolet light is an effective method of disinfection in drinking and wastewater applications. UV light damages the DNA of microbes, and is particularly effective against cryptosporidium. Federal regulations require two primary disinfectants for unfiltered water systems. The Carroll Water Treatment Plant added UV as a second disinfectant (in addition to ozonation) in February 2014 and the Quabbin Disinfection Facility (now named the William A. Brusch Water Treatment Facility) in Ware added UV (as a second disinfection in addition to chlorine) in October 2014.

**United States Geological Survey (USGS):** The federal agency that collects Geographic Information System (GIS) data for developing mapping protocols.

**Vector Jet Truck:** A vehicle used to clean and/or remove blockages from sewer lines by pushing and/or pulling fluids in the sewer.

**VMM:** Vehicle Management and Maintenance – The program responsible for management and maintenance of MWRA’s vehicles and heavy equipment.

**WASM (Weston Aqueduct Supply Mains):** Project involving the rehabilitation of the four Weston Aqueduct Supply Mains that carry potable water to MWRA’s service area. When complete, they will transmit about one-third of the water to MWRA’s service area and the City tunnel will carry the remaining two-thirds.

**Wastewater:** The water carried by sewers serving residences and businesses that enters wastewater facilities for treatment. Wastewater is any water that has been adversely affected in quality by anthropogenic influence. It comprises liquid waste discharged by domestic residences, commercial properties, and/or agricultural and can encompass a wide range of potential contaminants and concentrations.

**Wastewater Treatment Plant (WTP):** A facility containing a series of tanks, screens, filters, and other equipment and processes for removing pollutants from wastewater.

**Water Supply Trust:** The legislature further enhanced the ability of the Department of Conservation and Recreation (DCR) Office of Watershed Management to protect the source waters of the MWRA drinking water supply by establishing a Water Supply Protection Trust in 2004. The

trust provides a more efficient mechanism for MWRA's direct funding of the Office of Watershed Management. The Water Supply Protection Trust has a five person board of trustees responsible for approving the Annual Work Plan and Budget each spring for the following fiscal year.

**Watershed Reimbursement:** An amount that MWRA pays to the Department of Conservation and Recreation (DCR) each fiscal year for maintaining and managing the primary sources of MWRA's water supply (watersheds) in accordance with the laws of the Commonwealth of Massachusetts. The amount of the reimbursement is determined by prevailing legislation.

**Wholesale Water and Sewer Services:** Potable water and wastewater collection, transport, delivery, and treatment services that MWRA provides to communities. Communities provide the same services directly to retail customers or end users.

**WOCC:** Western Operations Control Center, located at the Carroll Water Treatment Plant.



