



MASSACHUSETTS WATER RESOURCES AUTHORITY

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October 31, 2023

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Boston, MA 02109-3912

Susannah King
Massachusetts Department of
Environmental Protection
Northeast Regional Office
150 Presidential Way,
Woburn, MA 01801

RE: NPDES Permit Number MA0103284
O&M Annual Report/Status Sheets

Dear Mr. Borci and Ms. King:

Enclosed please find the MWRA's annual status sheets on plant performance and maintenance for the period covering July 2022 – June 2023. This submittal fulfills the requirements of MWRA's NPDES Permit MA0103284 - Section 1.18.f and 1.18.g that states in part:

...The permittee shall report on the [operations and maintenance] plan's implementation and results to EPA and the MADEP on a yearly basis...An annual maintenance update shall be published in the MWRA's Annual Report. The MWRA shall submit an annual status sheet to EPA and the MADEP on plant performance, using key indicators for maintenance and providing detailed information on any necessary equipment replacement. The annual status sheet shall be placed on the MWRA web page for public information purposes.

If you have questions or need additional information, please feel free to email Betsy Reilley at Betsy.Reilley@mwra.com.

Sincerely,

David W. Coppes
Chief Operating Officer

Enclosures:

- Annual Report on Operations and Maintenance, FY2023
- Status Sheets with key indicators of maintenance, FY2023
 - Deer Island Treatment Plant
 - Wastewater Transport System
 - Fore River Pellet Plant

cc: F. Laskey, MWRA
Areeg Abd-Alla, Mass-DEP

MWRA Annual Report on Operation & Maintenance

July 2022 - June 2023

This report fulfills the requirements of MWRA's NPDES Permit MA0103284, Section 1.18.f, which states:

“Within ninety (90) days of the effective date of this permit, the permittee shall develop and implement a long-range operations and maintenance plan that will maximize the life of the treatment facility. The permittee shall report on the plan's implementation and results to EPA and the MADEP on a yearly basis.”

Also included with this submittal are the annual status sheets on plant performance and maintenance required in section I.18.g.

1. SYSTEM OVERVIEW

MWRA's Metropolitan Boston wastewater system consists of the Deer Island Sewage Treatment Plant, the wastewater collection system, and the Pelletizing Plant, described below.

Deer Island Sewage Treatment Plant

The Deer Island Sewage Treatment Plant (DITP) is the centerpiece of MWRA's \$3.8 billion program to protect Boston Harbor against pollution from Metropolitan Boston's sewer systems. The purpose of DITP is to remove human, household, business, and industrial pollutants from the wastewater collected and transported through 5,400 miles of pipes, community-owned sewer lines, and approximately 240 miles of Authority-owned interceptors and tunnels.

DITP is a state-of-the-art wastewater treatment facility and one of the most automated in the country. The MWRA has made a considerable capital investment to DITP, and is ensuring that this valuable public asset is maintained in the best possible manner. The MWRA's Board of Directors, Executive Director, management team, and staff are dedicated to providing the highest quality of asset management. The MWRA has assembled a highly skilled and qualified staff that ensures that the treatment plant is operated and maintained to the satisfaction of the regulatory agencies and the public.

Wastewater Transport System

The Wastewater Operations Department operates and maintains MWRA's wastewater transport system, which transports wastewater from MWRA member communities to the Deer Island Treatment Plant. This system includes a network of 240 miles of interceptor sewer lines and related appurtenances, a screen house, 13 pumping stations, four remote headwork facilities, three combined sewer overflow (CSO) treatment facilities and two CSO storage facilities. The primary goal of the Wastewater Transport system is to provide uninterrupted wastewater transport service in a safe, cost-effective, and environmentally sound manner.

Fore River Pelletizing Plant

The operation and output of the Fore River Pelletizing Plant is regulated, in part, by the terms of the federal NPDES permit, 40 CFR 503 regulations, and state sludge regulations in Massachusetts (310 CMR 32.00) and the states to which the pelletized product is shipped. Other external factors that influence the operation of the Fore River pelletizing Plant include an extensive residuals management facilities plan developed as part of the permitting process and MWRA'S commitment to local communities.

Under the terms of the current operating agreement between New England Fertilizer Company (NEFCO) and MWRA, NEFCO budgets for and performs all necessary predictive, preventive, and routine maintenance at the pellet plant. NEFCO's agreement contains a facility plan for the maintenance, repair, and operation. Currently, NEFCO's performance meets the standard for proper operation and maintenance. Since the inception of the agreement in March of 2001, there has not been an incident requiring an interruption in service.

The operating agreement requires NEFCO to provide a letter of credit for \$1,000,000 (adjusted for inflation) that MWRA might draw on in the event that there is a material breach of the operating agreement, such as inadequate maintenance of the facility.

2. PERMIT VIOLATIONS

There were no violations at MWRA facilities due to inadequate maintenance efforts.

3. FACILITIES ASSET MANAGEMENT PROGRAM

The goals of the MWRA multi-year maintenance plan include coordinated, consistent asset inventory; condition assessment, maintenance scheduling and long-term replacement planning. The MWRA has developed and implemented the Facilities Asset Management Program (FAMP). This asset management program addresses the goal of becoming more efficient by developing consistent best practices and cost-effective operations, and maintenance procedures.

MWRA had been conducting its maintenance on a calendar-based schedule in accordance with the original equipment manufacturers' (OEM) recommendations. This approach to maintenance was primarily driven by contractual obligations of the OEM warranties. MWRA's management team believed that it was important to modify its existing program to achieve a more rational approach to maintenance management. MWRA management acknowledges the importance of asset management and developed FAMP to meet the long-term demands of facility maintenance. The main objective of FAMP was to develop a sound maintenance strategy that would ultimately lead to better overall asset management, extended equipment life and increased reliability.

MWRA expanded its condition-monitoring program utilizing Reliability Centered Maintenance (RCM). This program prioritizes asset replacement, capital improvements, and staff training. Since the Maximo upgrade in 2018, DITP has continued to build the program with the addition of the Clinton site, and continuing to use the methodology of RCM, consolidating the tool database into Maximo, expanding a condition monitoring oil analyses by using on-site testing equipment, and continuously reviewing our metrics to ensure we are at or above industry benchmarks..

4. COMPUTERIZED MAINTENANCE MANAGEMENT SOFTWARE

MWRA uses Maximo, an Enterprise Asset Management (EAM) software program used by MWRA. Maximo EAM includes job and safety plan modules allowing MWRA to document hazardous areas and materials at DITP. Maximo can develop Lock-Out Tag-Out (LOTO) tasks and generate associated work orders for field personnel. Maximo's document management function streamlines maintenance and regulatory functions and workflow capabilities for synchronizing operations. Maximo applications can be fine-tuned to suit specific work processes or interface with other software programs.

Maximo helps operations and maintenance staff plan, prioritize and assign work based on labor and availability of required spare parts. Maximo's data analytic and reporting tools analyze failure trends in equipment, enabling staff to optimize preventive maintenance tasks and budget and plan asset replacement projects.

Maximo 7.6 added functionality to track labor, material, service, service contract, spare part costs and usage for over 143,500 assets.

Maximo 7.6 provides the MWRA with updated technology, increasing functionality for maintenance and improved reporting capabilities. The MWRA has transitioned to a consistent version of Maximo agency-wide, with Deer Island, Field Operations, Information Technology (IT) (formerly Management Information Systems (MIS) group), Laboratory asset tracking, and Vehicle Maintenance accessible in a single-organization, multi-site application. This increases productivity and limits the number of software systems needed to perform asset management functions. In addition, Maximo 7.6 add-ons include Maximo Calibration for instrumentation and SCADA assets and Maximo Spatial for buried assets and pipelines.

Clinton Advanced Wastewater Treatment Plant is now using Maximo 7.6. The Clinton Maximo site continues to be built out and PM schedules are in process.

Operations and Maintenance continues to collaborate with IT to enhance Maximo's automation capabilities, data display and reporting efficiencies, and end-user usability, along with preparing to upgrade Maximo to version 7.6.1. Contract 7649 Lawson / Maximo Interface Enhancements will enhance the existing interface between Lawson (Infor), MWRA's Enterprise Resource Planning (ERP) system and Maximo by adding additional functionality for the IT site while reducing data errors between the two systems. In addition, MWRA is upgrading Maximo to version 7.6.1.3, which is expected to go live in the third quarter of FY24.

NEFCo utilizes its own computerized maintenance management software, "E-maint." E-maint is used for work order management including preventive and corrective maintenance work.

5. SERVICE CONTRACTS

MWRA's maintenance program is supplemented by a series of service contracts. These contracts are intended to provide specialized services beyond the resources of the MWRA maintenance staff. Tables 1 and 2 below show the service contracts currently used by MWRA.

TABLE 1 DEER ISLAND CURRENT SERVICE CONTRACTS
Laser alignment
Boiler maintenance
CCTV maintenance
Centrifuge maintenance
Combustion Turbine Generator maintenance
Continuous emissions monitoring
Catch Basin Contract
Copier/fax maintenance
Crane maintenance
Cryogenics facility maintenance
Digester Mixer overhauls
Electrical testing
Elevator maintenance
Facilities coatings
HVAC chemical treatment (Legionella testing)
Fire Sprinkler Repair Contract
Hydro turbine generator maintenance
Hydraulic maintenance
Janitorial services
Lab hood certification
Locksmith services
Lube oil analysis
Oil/water separator cleaning
Overhead door maintenance
Pest control
Plant and Public access landscape services
Plant instrumentation and control system (PICS) maintenance
Pratt Whitney (CTG OEM) Preferred service
Reactor Mixer gearbox rebuild
Recycle contract (Scrap/Paper)
Security
Steam turbine generator maintenance
Trash removal
Vibration analysis

TABLE 2 FIELD OPERATIONS CURRENT SERVICE CONTRACTS
Elevator Maintenance
Crane Maintenance
Hydraulic Equipment Maintenance
Instrumentation Maintenance
Fuel Storage Tanks
Fire Alarm and Sprinkler
Air Compressor Service
Boiler and Water Heater
Pest Control Services
Trash Removal
Electrical Testing
Grounds keeping
Lube Oil Analysis
Union Park Station Operation and Maintenance
Generator Maintenance
Overhead Door Maintenance
Vibration Monitoring

6. ANNUAL STATUS SHEETS

The attached pages constitute the annual status sheets on plant performance, using key indicators for maintenance. There are status sheets for Deer Island, Wastewater Transport (Field Operations), and the Fore River Pelletizing Plant.

Status Sheets

Deer Island Treatment Plant

July 2022 - June 2023

Deer Island Maintenance reports on Key Performance Indicators for FY23.

- Preventive Maintenance (PM) – The maintenance goal is to complete 100% of all PM work orders. PM completion rate for FY23 was 99.9%. Maintenance initiated 22,131 PM work orders this year. This year's completion rate was slightly under our goal.
- Work Order Kitting - The first step to increase wrench time is to have all parts available for work orders. Kitting is a task where the maintenance planner identifies the specific parts required for a task on the work order, and electronically sends the information to warehouse personnel to assemble the parts in one location (kit) for the technician. Deer Island met its goal of 57% in FY23.
- Predictive Maintenance - Extending the useful life of equipment, by monitoring and trending equipment characteristics, allows for better planning for equipment replacement. Eight thousand and nineteen work orders were completed for vibration, acoustic ultrasonic, ultrasonic thickness, and oil analysis. Deer Island met its goal of 25% in FY23 of all work orders being categorized as predictive maintenance.
- Maintenance Backlog in Hours - Backlog is determined by totaling the planned craft hours on open work orders and comparing them to available craft resources. The average backlog in FY23 was 17,373 hours, equaling six weeks of work for the entire Maintenance workforce. This backlog is slightly above the industry standard of 8,730 - 17,460 hours or 4 - 6 weeks. To ensure the backlog does not adversely affect equipment availability, DITP monitors these metrics closely.
- Maintenance Overtime - The goal is to maintain maintenance overtime at or below 5% of total wages and salaries. DITP was below the benchmark at 4.8%.

Critical Equipment Availability: 12-Month Average — 99.8%

An equipment availability report is generated daily that details the critical equipment required to treat the maximum flow of approximately 1.3 billion gallons per day. Higher maintenance priority is given to critical equipment that drops below the number required to treat the maximum flow. No operational impact has occurred in the past year from a 99.8% versus 100% availability because the plant normally operates at approximately one-quarter of the design flow capacity..

Average Craft Hours and Work Orders per Month:

Preventative Maintenance	4299 hours	36%	1844 work orders	58%
Predictive Maintenance	160 hours	1%	798 work orders	25%
Corrective Maintenance	6112 hours	53%	312 work orders	9%
Emergency Maintenance	106 hours	1%	2 work orders	1%
Project Work	297 hours	1%	4 work orders	1%
Other (SERV, CBM, NPL, NE, EVT, STND.)	676 hours	6%	230 work orders	6%
Total	11,580 hours	100%	3191 work orders	100%

Total Work Orders:

38,290 work orders initiated in FY23
 35,412 work orders completed/closed in FY23

Maintenance Projects and Equipment Replacement:

- Heat Exchanger rebuilds of End Covers and Plates: \$129,000.
 There are eighteen Sludge Heat Exchangers in Digester Modules 1, 2 & 3 in Deer Island's Residuals Complex. DITP operates eight digesters and twelve heat exchangers at a time continuously. The heat exchangers are a key component to keeping the microorganisms healthy and active enabling high methane gas production by maintaining digested sludge at 98oF. The green energy produced from this process offsets operating costs. Recently, DITP Condition Monitoring staff reported that heat exchanger tube walls are thinning on two heat exchangers and may be developing leaks, and recommend replacing end covers. Due to the high temperatures of heat exchangers and the medium that runs through them, gaskets may break down and plates may fail. Staff replaced end covers, gaskets, and plates for two large heat exchangers.
- Reactor Aerator/Mixer Gearbox Rebuilds: \$211,206
 Secondary Reactor Batteries A, B, and C contain nine aerator trains, each train has (4) aerators and (4) mixers. In total, there are 72 gearbox drives with 36 aerators and 36 mixers. Each aerator and mixer has a triple reduction gearbox and mixing blade. When condition-monitoring techniques (oil analysis, vibration data and physical inspections) indicate a potential for failure, staff remove and ship out gearboxes to be refurbished back to original operational specifications. Two gearboxes were refurbished with new bearings, gears, seals and shafts.
- Boiler, STG and Hydro Plant Maintenance: \$1,516,239
 A maintenance contract was established for annual boiler preventive maintenance including necessary repairs. This contract was combined with similar contracts for the Hydroelectric plant and steam turbine generator (STG). The intention of combining three contracts under one was to save money on equipment and mobilization costs. Maintenance spending was on scheduled annual outage tasks and the replacement of two 24’’ valves located in the Thermal valve pit, repairing Hydro wicket gates and installing two (2) high-efficiency rotary lobe positive displacement pumps for the fuel oil system.

- Residuals Sump Pump Replacements: \$143,000
We have installed eight (8) two HP Weil sump pumps, piping and associated control panels. The primary purpose of these pumps are to contain and remove water from module 1, Digesters 1-2-3-4. Pitched flooring in the module 1 area helps direct water to channels leading to the sump pump. We experienced several failures with the pumps, which were from the original start-up of the plant. New pumps were installed along with new control panels, and there has been a substantial reduction in maintenance work orders.
- Grinder Rebuilds: \$220,620
The Residuals Complex at Deer Island has small Muffin Monster grinders installed "in-line" to provide continuous grinding of sludge into uniform, homogenized slurry. The sludge, which travels through these in-line grinders, is transported from Primary and Secondary treatment processes. The in-line grinders in Residuals are used after pre-treatment where solids and rags are removed. Normal wear and tear to the grinders caused by constant operation wear the gears and seals, requiring periodic service to rebuild the grinders or cutter blocks. Maintenance has noticed an increase in grinder rebuilds due to rags/wipes entering the plant. Staff replaced fourteen in-line grinders this year. There are spare grinders on-site to minimize downtime.
- Electric Vehicles: \$124,246
Deer Island Treatment Plant staff performs multiple job-related activities and tasks all around the large expanse of DITP's numerous buildings and facilities daily. The expansive nature of DITP's terrain requires the use of electric vehicles to ensure the most efficient transport of staff, tools, equipment, and supplies. Electric Vehicles save countless staff hours throughout the year. Utilizing these smaller electric vehicles is less costly than conventional vehicles and is significantly more environmentally friendly. Deer Island purchased ten long-bed electric vehicles for maintenance staff this year.
- HVAC Condenser Replacements: \$188,100
Three existing condensers became problematic over the past year. These have experienced multiple leaks, corrosion, and required frequent attention. The new condensers have a high-efficiency motor, 410A Freon, and high-efficiency refrigerant-cooled compressors. HVAC staff replaced condensers in the Gravity Thickener, Primary Operation Center, and Secondary Treatment areas. These also have a special coating to extend the useful life of the coils.
- Uninterrupted Power Supply, Battery Charger and Batteries: \$236,000
DITP purchased and installed an Uninterrupted Power Supply, Battery Chargers and Batteries. The two battery chargers and batteries were for the Main Switchgear Building. These batteries are responsible for DC control power for 15Kv breakers on our distribution system. This power is required for the 15Kv breakers to operate. They operate with open, close and trip functionality. A UPS is an electrical component that provides power to a critical load during an unanticipated power loss. Staff replaced the 30-kVA UPS in the South System Pump Station at Deer Island, which was approaching the 10-year mark. This replacement is part of our electrical asset replacement program to ensure replacement happens before the end of life.
- Lathe Replacement: \$114,000

The DITP Machine Shop lathe was installed as part of the DITP Maintenance and Warehouse fit-out in 1994 and is heavily used to fabricate replacement pipe sections, shafts and other custom-fabricated materials. The lathe is no longer operational. We replaced the existing lathe with a 24-inch heavy-duty precision engine lathe with a swing and center distance of 24 inches by 120 inches. This change will accommodate greater than the existing lathe's 12" pipe diameter limit. In addition, the lathe is equipped with an extra steady rest with roller jaws and a Newall DP-700 2-Axis Digital Readout for precision work.

- Elevator Service and Controller Replacement \$430,839
This contract covers Preventive Maintenance and project work. We have done substantial work on elevators to increase reliability. We have replaced one existing elevator controller in the Warehouse. We replaced the existing controller with a new Galaxy controller. The Galaxy controller's variable-frequency closed loop controller with phase 1-2 fire service and code-compliant features is a state-of-the-art system. The existing controller was obsolete. The new controller has increased reliability and reduced nuisance calls for the contractor.

Capital Projects

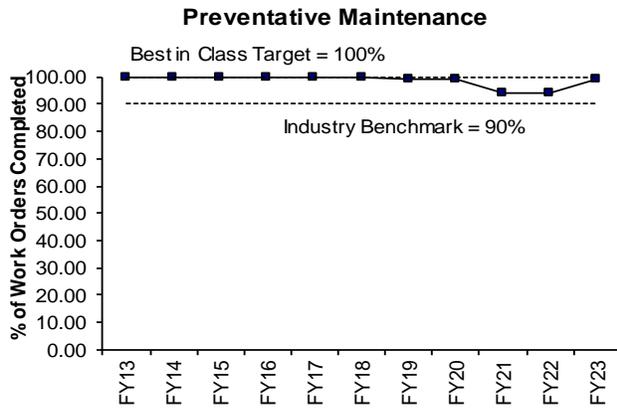
In addition to the maintenance projects listed above, the following Capital Improvement projects included work for Deer Island in FY23:

- Eastern Seawall Design/ESDC Contract 6723 (\$844)
- Fire Alarm System Replacement Design Contract 6904 (\$57,064)
- Combined Heat and Power Energy Alternatives Contract 6963 (\$16,564)
- South System Pump Station VFD Replacement Design/ESDC/Resident Inspection Contract 7126 (\$77,569)
- Radio Repeater System Upgrade Contract 7134 (\$1.4m)
- Clarifier Rehab Phase 2 Design/ESDC Contract 7394 (\$81,223)
- Clarifier Rehab Phase 2 Construction Contract 7395 (\$12.5m)
- As-Needed Design Phase 8-1 Contract 7501 (\$21,060)
- As-Needed Design Phase 9-1 Contract 7644 (-\$50,122)
It was initially anticipated that an extension of the contract would be required to finalize the DITP roofing project design. However, the design was completed without requiring an extension, indicating that this could be a budgeting overestimation.
- As-Needed Design Phase 9-2 Contract 7645 (\$37,981)
- Replace Odor Control Damper Contract 7913 (\$359,352)

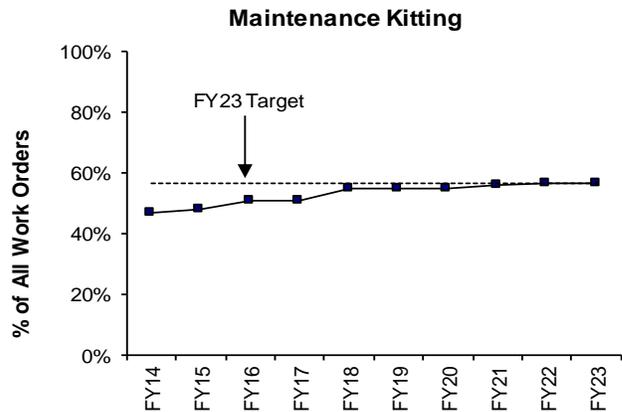
The following pages adapted from MWRA's quarterly performance report to the Board of Directors, the "Orange Notebook", summarize key indicators relating to Deer Island maintenance. The full Orange Notebook can be found at:

<http://www.mwra.com/quarterly/orangenotebook/orangenotebook.htm>.

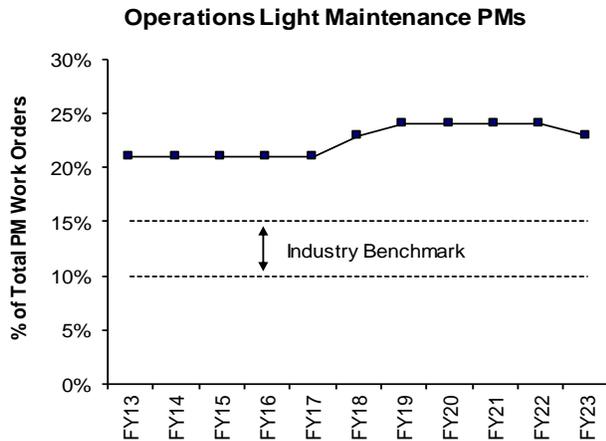
Deer Island Yearly Maintenance Metrics FY23 Proactive and Productivity Measures



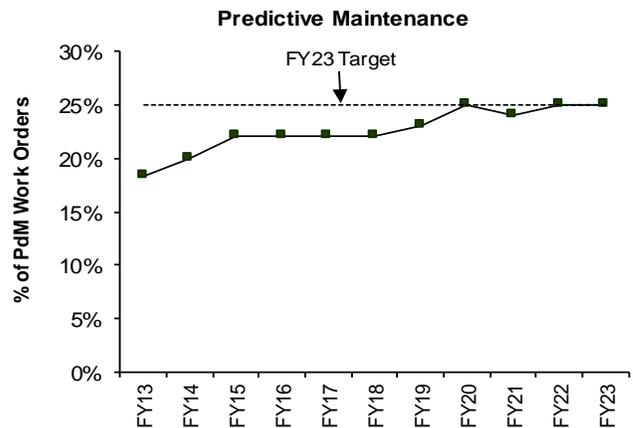
The industry benchmark is 90% for Preventative Maintenance (PM) completion. Upon reaching the 90% goal in FY05, the target goal was increased to the "Best in Class" Target of 100% PM completion. Reliability-Centered Maintenance (RCM) and PM optimization efforts have continued. PM completion rate was 99% in FY23.



Preventative Maintenance (PM) inventory items were loaded into Maximo to assign spare parts for equipment to PM work orders. DITP reached the PM kitting goal of 100%. In FY12 a new graph was developed to track kitting of all maintenance work orders in an effort to increase wrench time. Staff continues to fine-tune the process to "kit" all maintenance work orders. Kitting is considered a best practice by maintenance and reliability professionals. It entails staging parts necessary to complete maintenance work. Kitting allows maintenance staff to spend more time "turning the wrench" and less time waiting for parts at the stockroom window. Kitting for FY23 was 57%, meeting DITP's goal of 57%.



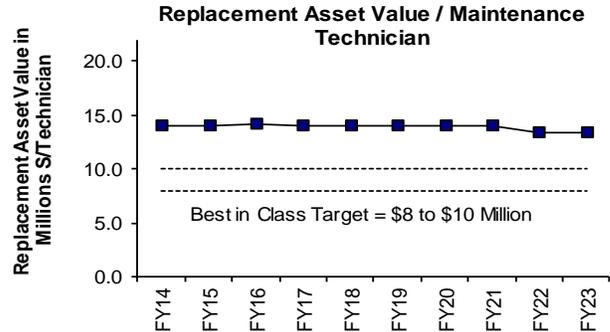
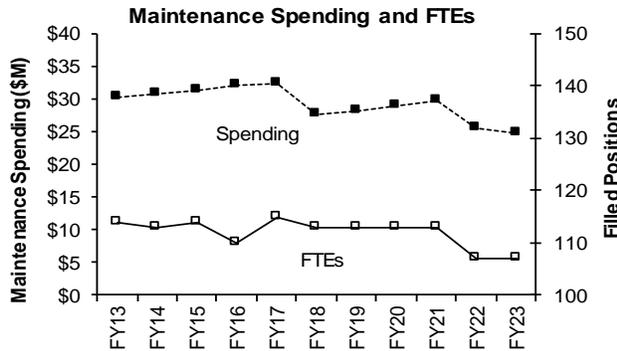
The percentage of preventive maintenance work orders completed by Operations staff (non maintenance staff) increased from less than 1% in January 2002 to the current level of 23% in FY23. DITP reached the industry benchmark range of 15% and has exceeded the goal through FY23. The slight decrease of Operations PM work orders is due to adjusting frequencies during the year to meet plant needs.



Predictive maintenance has steadily increased from 2% in FY03 to 25% in FY23, DITP met the FY25 goal of 25%. This percentage in predictive maintenance was achieved through the expanded use of lubrication, vibration, thermography, and acoustic ultrasonic testing techniques. The Condition Monitoring Group continually reviews and investigates new opportunities and initiatives to expand condition monitoring testing and analysis.

Deer Island Yearly Maintenance Metrics FY23

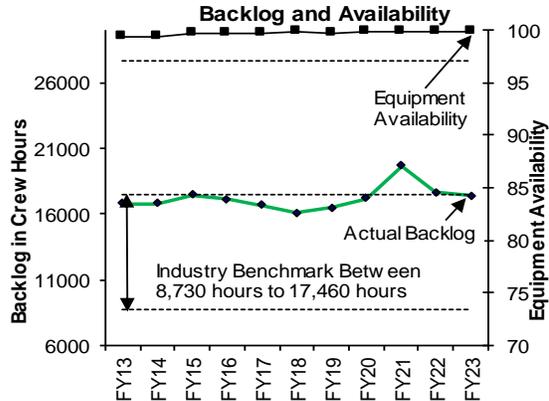
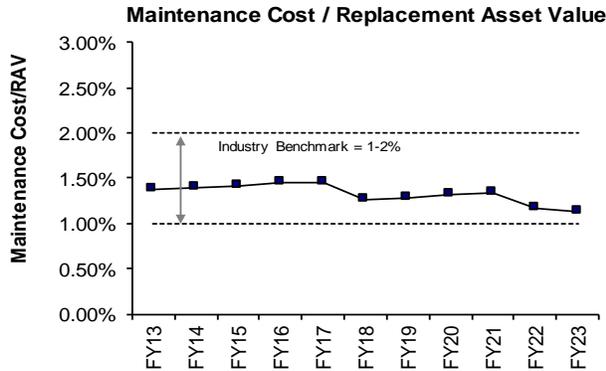
Overall Maintenance Program Measures



DITP's Maintenance staff is currently at 107 FTEs. Maintenance staff levels ended at 107 due to retirements and hiring challenges for trades personnel. Maintenance has worked to meet our goals through implementation of numerous maintenance efficiencies including: Operations performing light maintenance, cross-functional training and flexibility, and Reliability-Centered Maintenance. This year's overall Maintenance spending decreased slightly.

DITP adopted a "best in class" target of \$8-\$10 Million/Technician for maintenance staffing. DITP remains above this Best in Class. However, as the plant ages and additional equipment replacements are expected, DITP management will reassess staffing as needed.

The Maintenance Spending graph shows actual annual maintenance spending and CIP asset replacements (equipment costs only). Maintenance staff continues to evaluate plant assets and requirements for replacement of obsolete equipment to ensure the plant operates at maximum efficiency. In FY23, overall spending decreased slightly from FY22 due to a reduction in CIP Spending. Maintenance Projects in FY23; Replacement of Odor Control Dampers, Station Batteries replaced in Main Switchgear Building, Radio system upgrade, Replacement of four large valves on the hot water system, Installation of Gas Protection System panel in North Main Pump Station, Installation of LED Emergency Lights, and installation of LED lights for the Digester Complex.



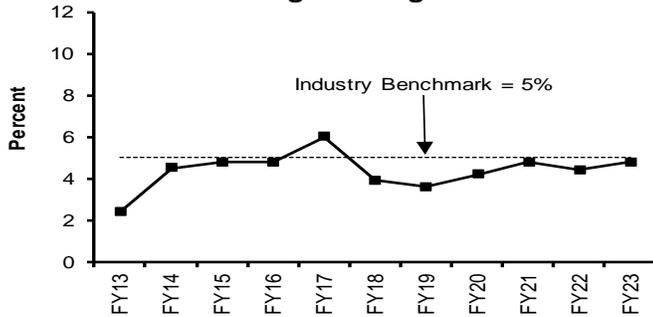
The industry benchmark for annual maintenance spending is between 1% to 2% of replacement asset value, currently DITP is at 1.13%. The plant's replacement asset value is calculated at approximately \$2.6 billion dollars. DITP's current maintenance spending is within the industry benchmark. Overall maintenance spending has decreased slightly from last year. DITP Maintenance CEB spending is \$23.5 million. CIP spending was \$1.1 million (equipment costs only). CIP/CEB Spending totaled \$24.6 million in FY23.

Industry benchmark for Equipment Availability is 97%. Deer Island has exceeded this benchmark over for the last ten years. In FY23 the availability was 99%. The high percentage in Equipment Availability during FY23 is due to redundancy of equipment and effective/efficient maintenance practices.

Industry Benchmark for Backlog is between 8,730 to 17,460 hours for maintenance based on current staffing, the total average backlog for FY23 was 17,373 hours, which is within the industry benchmark. DITP Maintenance has made significant progress over the last year to be within the Industry Benchmark, after being over the previous two years.

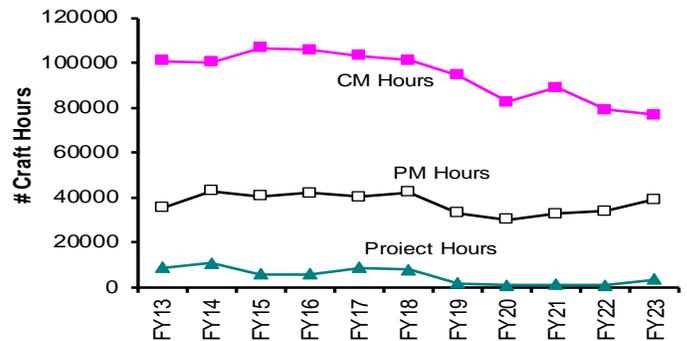
Deer Island Yearly Maintenance Metrics FY23 Overall Maintenance Program Measures (cont.)

Overtime (excluding Storm Coverage) as a Percentage of Wages & Salaries



Management continues its effort to keep overtime below the industry benchmark. DITP maintenance overtime was 4.8% for FY23. Management has taken steps to reduce overtime spending by limiting overtime to repair critical equipment and systems only. DITP has been under the Industry Benchmark every year except FY17, due to the increase in overtime for the Eversource Cable Outage.

Craft Hours



This year's slight decrease in Corrective Maintenance (CM) hours was due to staff working on projects which slipped during Covid to increase equipment performance and extend the useful life of the equipment.

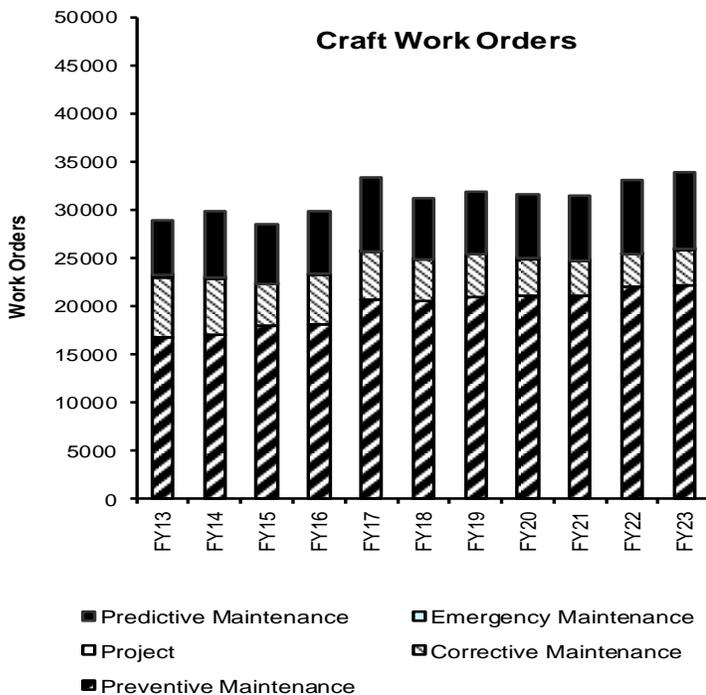
This year's slight increase in Preventive Maintenance (PM) was due to completing additional PM work orders than previous year. Staff continued to work on optimization of the Preventive Maintenance (PM) program

This year slight increase in Project Work (PROJ) was due to catching up on critical project to enhance operations ability to operate the plant and increase equipment performance.

Maintenance did complete some significant maintenance work in FY23: Plumbers installed 400' of stainless steel pipe and replaced sixteen service valves which were corroding. This system allows service water to flush out grit classifier. This extend the life of the service system and increase performance of grit classifiers. Electricians supported the replacing one existing elevator controller in the Maintenance building. We replaced the existing controller with a new Galaxy controller. The Galaxy controller is a variable-frequency closed loop controller and code compliant features is a state of the art system. The existing controller was obsolete. HVAC staff replaced four large valves on the hot water loop. Mechanical staff changed out numerous in-line grinders due to the additional clogging due to wipes in the system.

During FY23, the overall number of work orders slightly increased from the previous year. The increase is due to equipment replacements, with increased preventative schedules. The Work Coordination department is continuously modifying PM, PdM, and CM Job Plans to ensure maintenance is being performed efficiently and effectively, while ensuring reliability and availability of DITP's Assets.

Craft Work Orders



Status Sheets
Wastewater Transport System
July 2022 - June 2023

The Field Operations Department Equipment Maintenance reports on key performance indicators for FY23. Monthly maintenance data are tracked under six headings.

- Operations Light Maintenance Hours – In an effort to free up Maintenance staff to complete more detailed and complex maintenance, Operations staff have been committed to completing a number of the routine monthly preventative maintenance (PM) tasks. These tasks generally consist of observation and light maintenance tasks. The industry benchmark is 10% - 15% of the total preventative maintenance hours. In FY23, Operations staff completed an average of 311 hours per month, which accounted for 11% of the total preventative maintenance hours.
- Overall Preventive Maintenance – Both operation and maintenance staff complete the preventive maintenance work orders. The goal for FY23 was to complete 100% of all preventative maintenance work orders. The PM completion for FY23 was 100%.
- Work Order Kitting – In an effort to more efficiently complete work, maintenance staff and work coordination center staff have utilized the Lawson/Maximo interface to better kit stock and non-stock material. The goal is to kit 60% of all work orders. The average for FY23 was 63% of all work orders.
- Operations Light Maintenance % PM Completion – In an effort to free up Maintenance staff to complete more detailed and complex maintenance, Operations staff have been committed to completing a number of the routine monthly preventative maintenance duties. The goal for Operations staff is to complete 100% of the Preventative Maintenance work orders. In FY23, Operations staff completed 100% of the work orders.
- Maintenance Backlog in Crew Hours - Backlog is determined by totaling the planned craft hours in open work orders and comparing them to craft resources available. The FY23 backlog average was 14,046 hours. This backlog is slightly above the industry standard of 6,636 to 13,275 hours or 4 to 6 weeks. Metro Maintenance monitors these metrics closely to ensure the backlog does not adversely impact equipment availability.
- Maintenance Overtime – Maintenance overtime spending was \$364,726 under budget for FY23. Overtime was used to support call-ins for emergency maintenance and planned overtime. It was also used for maintenance coverage related to weather events.

Facilities Operational Statement

During FY23, Wastewater Transport facilities operated at full capacity. All required equipment to maintain the flow and processing of wastewater was available. The CSO facilities operated with sufficient chlorination and de-chlorination, though some NPDES exceedances were reported. The required number of pumps in each gravity and pumping CSO was available throughout the year.

Critical Equipment Availability

An equipment availability report is generated daily. It details the critical equipment required to collect and transport the wastewater flow at the facility design capacity. Higher maintenance priority is given to equipment that drops below the number required. Because of the high daily equipment availability, no operational impact has occurred in the past year.

SCADA Program

The MWRA Supervisory Control and Data Acquisition (SCADA) system provides a means of monitoring and controlling facilities and equipment from a remote centralized location, as well as providing a continuous record of facility operations. The SCADA System has been in place at all field facilities since FY10. SCADA staff perform minor and medium updates on the system throughout the year. As Capital Improvement Projects are planned at each facility, SCADA improvements are included as part of the facility upgrade.

MWRA SCADA staff perform the required maintenance and upgrades to the majority of the field instrumentation and control panel equipment to ensure accurate measurements and continued operation throughout MWRA's field facilities. During FY23, these efforts were supplemented by an Instrumentation Service Contractor who was primarily responsible for performing calibrations and corrective service to the gas monitoring systems within facilities. SCADA staff also maintain, upgrade, program, and patch the computers and hardware used in collecting, controlling, transmitting and displaying facility data. During FY23, continued emphasis was placed on improving MWRA's cyber security posture. This included the expansion of the SCADA communications network "Domain" architecture, where user accounts and policies are centrally managed via a "Domain Controller."

Maintenance Projects and Equipment Replacement

Equipment replacement is part of the overall maintenance strategy that ensures compliance with permit requirements. Projects and initiatives are completed during each fiscal year to maintain redundancy and continued reliability. Many projects are extensive, requiring significant in-house resources and the use of specialty/service contractors. Some examples of key improvements, equipment replacement, or significant repair work during the past fiscal year include in-house and outsourced projects.

In-House Projects

Work continues to maintain the reliability and availability of the equipment at all wastewater facilities through Preventive and Predictive Maintenance Practices. The following is a detailed list of in-house work performed at all wastewater facilities in Metro East.

- Hayes Pump Station: Plumbers installed new suction and discharge gauges needed for flow tests for rehabilitation
- DeLauri Pump Station: Machinist's fabricated new rake guides with structural enhancements which will prevent the rakes from catching and tripping the clutch
- New Neponset Pump Station: Electricians replaced fixtures with more efficient LED explosion-proof lighting in the Wet Well and Screen Room areas
- Hingham Pump Station: Electricians installed new LED explosion-proof fixtures in Wet Well
- Hingham Pump Station: Plumbers installed new suction, discharge and check valves for three RWW pumps
- Hingham Pump Station: Plumbers installed a new plug valve on the bypass pump connection
- Braintree Weymouth Intermediate Pump Station: The Electrical Service Vendor removed and replaced the Facility Main Transformer with a Temporary Transformer
- Nut Island Headworks: Machinists, Welders and Mechanics fabricated and installed a new baffle box for Grit Vortex #6
- Nut Island Headworks: Mechanics and Machinist replaced Screen Conveyor #2 carry belt, worn bearings, shafts and rollers
- Columbus Park Headworks: Mechanics rehabilitated the #3 channel, replacing all collector and drive chains, a head shaft, sprockets and flights
- Chelsea Creek Headworks: Mechanics inspected Channel # 1 as part of facility turnover from Construction
- Somerville CSO Chemical Building: Electricians installed new LED exterior lighting
- Chelsea Administration Building: Plumbers and Facility Specialists removed and replaced shower stalls in first-floor women's locker room
- Electrical Thermal Imaging: Electrical Service Contractor and Medium Voltage Electricians performed non-invasive thermal imaging scans at Columbus Park Headworks,

Ward Street Headworks, Hayes Pump Station, Squantum Pump Station, New Neponset Pump Station, Braintree/Weymouth Replacement Pump Station, Quincy Pump Station, Framingham Pump Station, Somerville Marginal CSO, Cottage Farm CSO, Somerville Marginal CSO and Cottage Farm CSO

Capital Projects

In addition to the maintenance projects listed above, the following Capital Improvement projects are underway or completed in FY23.

Construction and Design Projects Started or Ongoing during FY23 Include:

- Nut Island Headworks Odor Control & HVAC Improvements – Construction Contract 7548 (ongoing)
- Braintree-Weymouth Pump Station Improvements - Construction Contract 7366 (ongoing)
- Remote HW Access Shaft Improvement – Construction Contract 7550 (100% complete)
- CHE008 Pipe Replacement Construction – Construction Contract 7915 (100% complete)
- Somerville Marginal CSO Facility MWR205 Tide Gate Replacement – Construction Contract OP-429 (100% complete)
- Prison Point CSO Discharge Piping Rehabilitation – Construction Contract 8013 (awaiting NTP)
- Ward St. & Columbus Park Headwork Design/CA – Contract 7429 (in progress)
- Hayes PS Rehab. Design/CA – Contract 7162 (100% design in review)
- Siphon Structure Rehab Design/CA – Contract 6224 (100% design in review)
- Interceptor Renewal No. 7 Malden-Melrose Design/CS – Contract 7216 (100% design in review)
- Somerville Marginal New Pipe Connection – Contract 7985 (100% design in review)
- Caruso, DeLauri, Framingham and New Neponset Pump Stations and Cottage Farm CSO Facility Fuel Storage Tank Replacements – Siting Evaluation, Final Design and Bidding - Contract No. 7692 Task Order 4 (in progress)

Pipeline Preventative Inspection and Maintenance Projects

Manhole Inspection and Rehabilitation Program

The Technical Inspections Unit (TIU) of the Wastewater Operations Department conducts manhole inspections. These inspections facilitated the beginning of the manhole rehabilitation program. Specialized equipment and training are the essential elements of the program. Pipeline maintenance crews perform manhole renovations and repairs that result in reduced I/I. The manholes are coated using cementitious material applied with spinning equipment and then covered with special coatings to resist corrosion from hydrogen sulfide.

In FY23, TIU staff inspected 652 manholes. In-house staff rehabilitated approximately 38 manholes. The rehabilitation work included frame and cover replacement, external repairs to raised manholes, internal repairs using the spin-cast application, and other miscellaneous repair work.

Pipeline Rehabilitation Projects

Pipeline Rehabilitation projects are first identified by the TIU during routine television inspections of the pipelines and interceptors. MWRA engineers review these projects and perform or coordinate all necessary design and construction contracting. The following are the pipeline construction/rehabilitation projects under design & construction in FY23:

- Siphon Structure Rehab Design/CA – Contract 6224 (100% design in review)
- Interceptor Renewal No. 7 Malden-Melrose Design/CS – Contract 7216 (100% design in review)

Pipeline Inspection and Cleaning Projects

To efficiently and consistently maintain the wastewater collection system, the Technical Inspection and Wastewater Pipeline Maintenance groups were merged. The work performed by the inspection staff is an important element in the planning and execution of pipeline maintenance work. The inspection tasks are shared by the entire staff and the maintenance workload is prioritized based on inspection data and information.

TIU conducts internal inspections of MWRA structures and pipelines to reveal potential problem areas and identify locations requiring maintenance. Pipeline inspections average about 70% of the workload followed by inspections of other structures and manholes. Approximately 33.62 miles of pipelines were TV inspected in FY23.

Pipeline maintenance crews perform a variety of maintenance activities for the MWRA's Wastewater Transport system. The Transport collection system includes 240 miles of interceptor sewer lines. Approximately 37.85 miles of pipeline and 46 siphons were cleaned in FY23.

In addition to general pipeline and manhole repair work performed under this program, the following are other activities pipeline crews perform during the year:

- Pipeline spot repair work in shallow excavations
- Clear obstructions and clean sections in community lines under the Community Assistance Program

- Snow plowing and removal during winter months
- NPDES inspections and best practice management activities
- Emergency pumping activities for communities during major wet weather events
- By-pass pumping for contracted pipeline rehabilitation or repairs
- Emergency response and overflow monitoring during wet weather events
- Response to odor complaints in the system

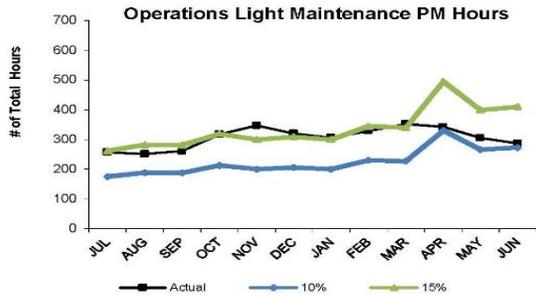
The following pages adapted from MWRA's quarterly performance report to the Board of Directors, the "Orange Notebook", summarize key indicators relating to Wastewater Transport Pipeline Maintenance and Equipment/Facility Maintenance. The full Orange Notebook can be found at:

<http://www.mwra.com/quarterly/orangenotebook/orangenotebook.htm>.

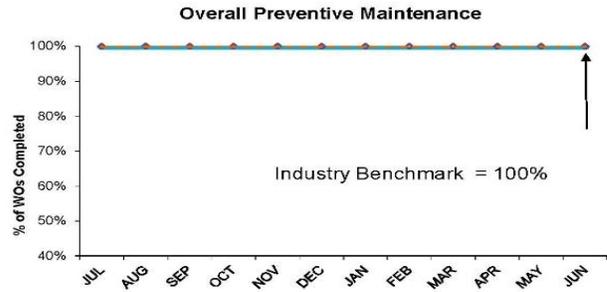
Wastewater Transport

Overall Field Operations' Metropolitan Equipment & Facility Maintenance FY23

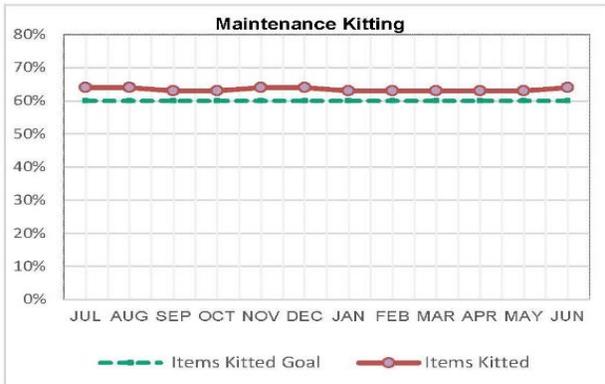
Several maintenance and productivity initiatives are in progress. The goal for the Overall PM completion and the Operator PM completion is 100%. The Operator PM and kitting initiatives frees up maintenance staff to perform corrective maintenance and project work, thus reducing maintenance spending. Backlog and overtime metrics monitor the success of these maintenance initiatives.



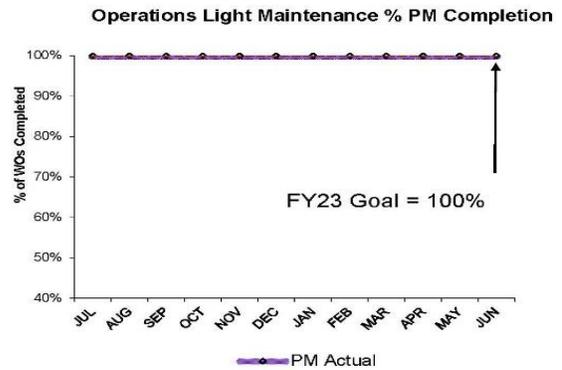
As part of efforts to improve efficiency, Operations staff completed 3674 hours of preventive maintenance in FY23, about 14% of the total PM hours, which is within the Industry Benchmark of 10% to 15%. Operations completed 100% of their scheduled PMs.



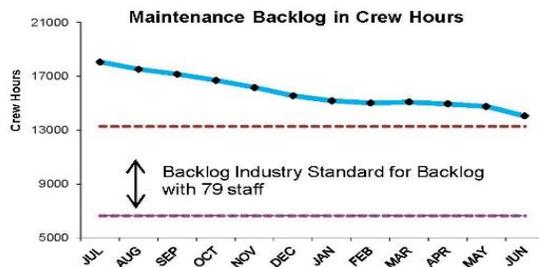
In FY23, Field Operations completed 100% of all PMs. Maintenance staff completed 100% of their assigned PMs and Operations staff completed 100% of their assigned PMs.



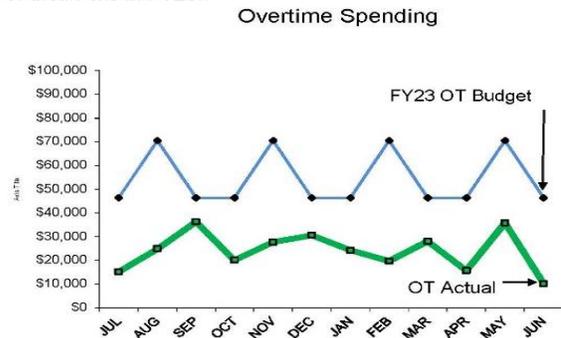
Operations' FY23 maintenance kitting goal has been set at 60% of all work orders to be kitted. Kitting is the staging of parts or material necessary to complete maintenance work. In FY23, 63% of all applicable work orders were kitted. This resulted in more wrench time and increased productivity.



Wastewater Operations complete light maintenance PM's which frees up maintenance staff to perform corrective maintenance. Operations' PM goal is the completion of 100% of all PMs each month. Operations completed 100% of their PMs in FY23.

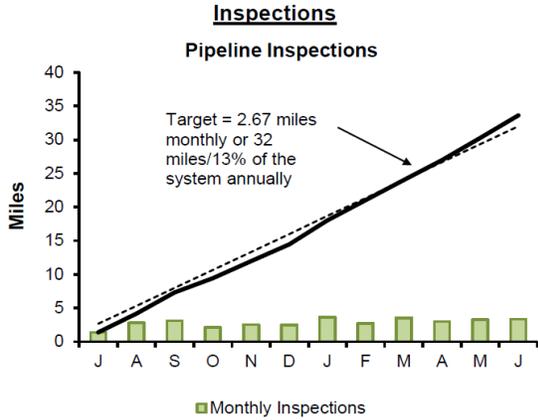


Current backlog is at 14,046 hours while overtime spending was \$364,727 under budget for FY23. The industry standard for maintenance backlog with 79 staff is between 6,636 and 13,275 hours.

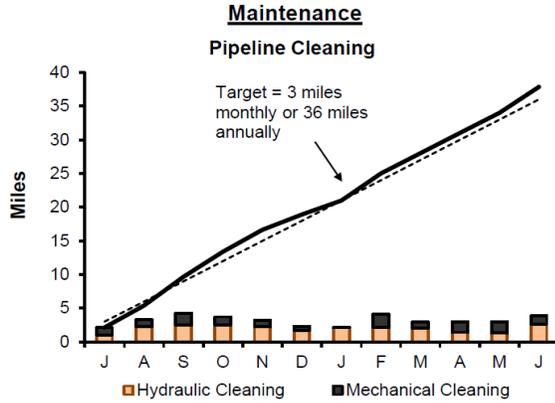


Maintenance overtime spending for FY23 was \$287,825, which was \$364,727 under budget. Overtime in FY23 was used for critical maintenance repairs and wet weather events.

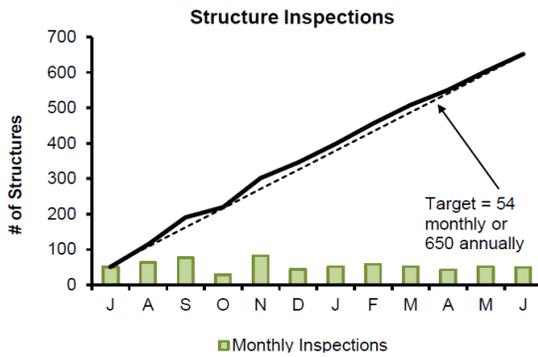
Wastewater Pipeline and Structure Inspections and Maintenance ONB 4th Quarter - FY23



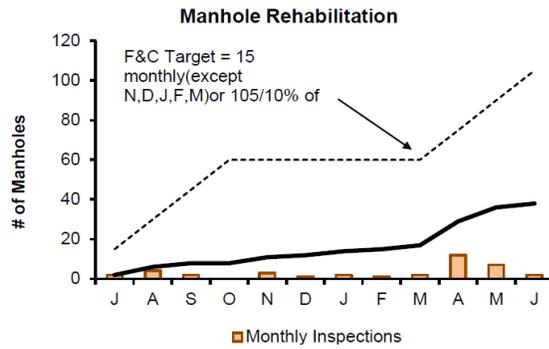
Staff internally inspected 9.62 miles of MWRA sewer pipe during this quarter. The year to date total is 33.62 miles. No Community Assistance was provided.



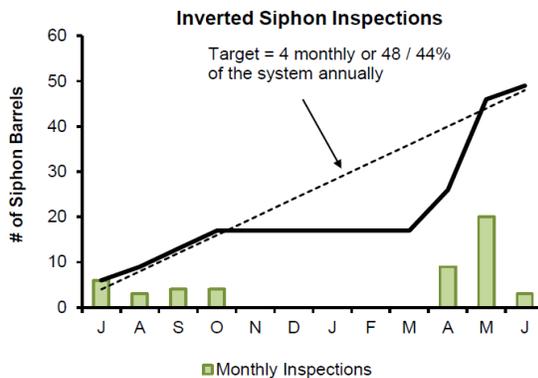
Staff cleaned 9.85 miles of MWRA sewer pipe, and removed 43 yards of grit. The year to date total is 37.85 miles. No Community Assistance was provided.



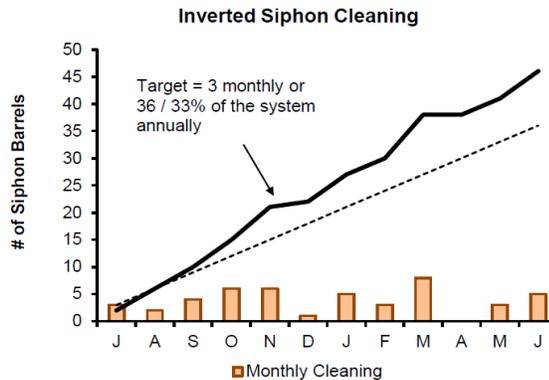
Staff inspected the 36 CSO structures and performed 108 other additional manhole/structure inspections during this quarter. The year to date total is 652 inspections.



Staff replaced 21 frame and cover replacements this quarter. The year to date total is 38.



Staff inspected 32 siphon barrels this quarter. The year total is 49 inspections.



Staff cleaned 8 siphon barrels this quarter.

Status Sheets
Fore River Pelletizing Plant
July 2022 – June 2023

Critical Equipment Availability: 83.33%

In FY23, operating logs indicate that of the 2,190 machine days, centrifuges were available for 1,825 days for an availability of 83.33%. Two rotating assemblies were at the OEM repair shop for a total of 365 days. The centrifuges and ancillary equipment make up the critical components at the Pelletizing Plant because dewatered sludge can be processed through the dryers or sent through a bypass system to trucks and taken to a landfill. The primary driver of downtime was the disassembly and cleaning of the rotating assemblies. At present, 10 of 12 centrifuges are available, giving the Plant more than enough capacity to process flows from Deer Island. The facility currently operates on a 5-day workweek, ceasing operations on most weekends.

Maintenance Work Orders and Backlog:

In FY23, there were 1,917 work orders created in the eMaint CMMS, 1,128 of those were PMs, 185 were planned, 502 were unplanned and 102 were listed as safety work orders. As of 7/1/23, there were 466 open work orders, 190 of them PMs representing an 83.2% completion rate. Currently, 346 FY23 work orders are outstanding, primarily long-term identified corrective/improvement WOs.

The Preventative Maintenance system is continuously being modified to include updates for equipment changes, new lubrication schedules and new equipment inspection and cleaning practices. In addition, the operations staff are utilizing the system to track non-routine cleaning tasks to better gauge necessary frequency and to allow these cleanings to be scheduled as preventative rather than corrective actions.

Maintenance:

More than \$1.40 million was spent on replacement parts and maintenance-related items in FY2023, including:

- Replaced train 1 Mixer B screw after a break due to corrosion
- Repaired mixer B screw on train 4. Cleaned and repaired corroded crack on the screw and put it back in service
- Replaced 45° elbows on silos 1-5 transport line
- Replaced SE trunnion on dryer drum 4
- Replaced ceramic media in two of four RTO's
- Centrifuge repairs – two complete rotating assemblies were sent back to the manufacturer and have been overhauled to OEM condition
- Rebuilt multiple Dzurick valves
- Conveyor Repairs – Several small to medium repairs were complete