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October 31, 2024

Todd Borci
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ECAD4-4
5 Post Office Square, Suite 100
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 2023 – June 2024. 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 David Wu at David.Wu@mwra.com.

Sincerely,

David W. Coppes
Chief Operating Officer

Enclosures:
- Annual Report on Operation and Maintenance, FY2024
- Status Sheets with key indicators of maintenance, FY2024
  - 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 2023 - June 2024

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 the authority maintains this valuable public asset 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 operates and maintains the treatment plant to meet the satisfaction of 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. Contractual obligations of the OEM warranties primarily drove this approach to maintenance. 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 upgrade from Maximo 5.2 to the 7.6 platform 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. 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 to better 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, 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. Contract 7649 Lawson / Maximo Interface Enhancements was completed in the last quarter of FY24 enhancing 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. The contract also upgraded MWRA's Maximo version to 7.6.1.3. Operations and IT are now starting preparation to migrate both Lawson and Maximo to the cloud as Lawson is in the process of being upgraded to version 11 and Maximo will be upgraded to Maximo Application Suite (MAS) version 9 at a later date.

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

A series of service contracts supplements MWRA's maintenance program. These contracts aim to provide specialized services beyond the resources of the MWRA maintenance staff. Tables 1, 2 and 3 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

TABLE 3 FORE RIVER PELLETIZING PLANT CURRENT SERVICE CONTRACTS
Elevator Maintenance
Crane Maintenance
Fire Alarm and Sprinkler
Air Compressor Service
Boiler and Water Heater
Pest Control Services
Trash Removal
Electrical Testing
Fenwal Explosion Suppression System

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 2023 - June 2024

Deer Island Maintenance reports on Key Performance Indicators for FY24.

- Preventive Maintenance (PM) – The maintenance goal is to complete 100% of all PM work orders. PM completion rate for FY24 was 99.9%. Maintenance initiated 20,784 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 FY24.

- Predictive Maintenance (PdM) Extending the useful life of equipment, by monitoring and trending equipment characteristics, allows for better planning for equipment replacement**.** Deer Island's FY24 predictive maintenance goal is 100%. DITP completed 99% of all PdM work orders. 8,019 work orders were completed for vibration, acoustic ultrasonic, ultrasonic thickness, and oil analysis. Deer Island met its goal of 25% in FY24 of all work orders being cataloged 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 FY24 was 17,411 hours, equaling six weeks of work for the entire Maintenance workforce. This backlog is slightly below 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 4.0%.

- 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 Deer Island Operations staff is to complete 100% of the Preventative Maintenance work orders. In FY24, Deer Island Operations staff completed 100% of the work orders.

Critical Equipment Availability: 12-Month Average — 99%

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% 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	2799 hours	27%	1732 work orders	57%
Predictive Maintenance	116 hours	1%	694 work orders	23%
Corrective Maintenance	6399 hours	62%	286 work orders	9%
Emergency Maintenance	82 hours	1%	3 work orders	1%
Project Work	110 hours	1%	6 work orders	1%
Other (SERV, CBM, NPL, NE, EVT, STND.)	788 hours	8%	323 work orders	10%
Total	10,294 hours	100%	3,044 work orders	100%

Total Work Orders:

36,528 work orders initiated in FY24
33,569 work orders completed/closed in FY24

Maintenance Projects and Equipment Replacement:

- Boiler, STG, Wind Turbine and Hydro Plant Maintenance: $1,662,736
  A maintenance contract was established for annual boiler preventive maintenance including necessary repairs. This contract was combined with similar contracts for the Hydroelectric plant, Wind Turbines and steam turbine generator (STG). The intention of combining the four contracts under one was to save money on equipment and mobilization costs. Maintenance spending focused on scheduled annual outage tasks and the replacement of piping located in the thermal valve pit, which required extensive welding and the addition of two drain valves. The Hydro facility required replacement of the turbine runner. We also inspected the nose cone and speed increaser.

- Reactor Aerator/Mixer Gearbox Rebuilds: $373,855
  Secondary Reactor Batteries A, B, and C contain nine aerator trains, each train has four aerators and four 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. Four gearboxes were refurbished with new bearings, gears, seals and shafts.

- Feed Ring modification $198,000
  In Residuals digesters MOD-1, we have four digesters each having a feed ring that goes around the cat walk that consist of six ports. Operations and maintenance have determined that the feed ring does not work properly, resulting in grit and ferric to remain trapped in the line causing deterioration of the piping that produces leaks at the base of the digesters. We have developed a solution to cap the back four ports and replace the two main 12” plug valves going to the two remaining ports. In addition, we inspect the condition of the glass-lined piping and change as needed.

- Grinder Rebuilds: $179,938
  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 twelve in-line grinders this year. There are spare grinders on-site to minimize downtime.

- Electric Vehicles: $163,220
  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 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.

- Digester Mixer Rebuild $100,940
  There are twelve egg-shaped anaerobic sludge digesters at DITP, which have been in operation for more than 25 years. DITP operates eight mixers concurrently and continuously. A key component common to all of the digesters is the central mixer assembly. The mixer is critical to the proper operation of the digester. Routine maintenance is performed on the mixer assembly along with Predictive Maintenance. Acoustic and vibration monitoring tasks help assess asset health and can indicate impending failures before the failure becomes catastrophic and costly. When an impending failure is detected, staff removes and ships the mixer assembly to the manufacturer for refurbishment to original equipment manufacturers (OEM) specifications. Digester Module 1 Mixer Assembly 1 was refurbished.

- Residuals Sump Pump Replacements: $99,650
  We have installed eight (8) two HP Weil sump pumps, piping and ultrasonic level detectors and associated control panels. The primary purpose of these pumps are to contain and remove water from module 1, Digesters 1- 2-3-4. The pitched flooring in the Module 1 area helps direct water to channels leading to the sump pumps. 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.

- HVAC Methane Chiller replacement $75,626
  HVAC replaced one of our modular 60-ton methane chillers located in Residuals. This chiller is to cool and remove moisture from the methane gas, which comes from the Digesters by keeping a temperature of around 40 degrees Fahrenheit. The methane gas from the chiller is sent to the Power Plant to be used as a fuel source, which results in reduced energy costs. The existing methane chiller became problematic over the past few years. Due to the chiller, being positioned outside it is very susceptible to both salt air and H2s. The frame and control had severe corrosion and had multiple compressor failures. The chiller is provided with a special coating to extend the useful life.

- Uninterrupted Power Supply $75,461
  DITP purchased and installed two Uninterrupted Power Supply (UPS) and Batteries. The UPSs changed out are used to back-up small program logical controllers, which control

equipment in Battery D and Hydro facility, which were approaching the ten-year mark. A UPS is an electrical component that provides power to a critical load during an unanticipated power loss. The batteries changed out were for Primary Operations UPS 2 and 3. These replacements are part of our electrical asset replacement program to ensure replacement happens before the end of life.

- Sample Shed $67,987
  DITP purchased a large shed for process control group. The shed was installed outside of the grit building and was to house a wastewater sampler. Due to the environment inside the grit building, which caused numerous maintenance issues, which resulted in difficulty, acquire samples. The shed includes electrical equipment such as outlets, switches, lights, vent fan, and a control panel. The plumbing work included coring a hole to connect inside the building, drain line, and connecting W1 water source.

- Heat Exchanger rebuilds of End Covers and Plates: $58,800.
  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 simultaneously and 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 98F. 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.

- Conveyor Replacement $41,600
  The conveyor belt system is used to move grit from the grit classifiers along the wall and then dropped down to one of two trailers in the truck loading bays located in the east and west ends of the Grit Facility. Grit contained in these trailers is hauled away and disposed of in a licensed landfill. Due to the harsh product of grit which sometimes gets under the conveyor belt, scraper blades and rollers can cause belt to wear or tear causing grit to accumulate on the ground instead of depositing in the trailers. Routine maintenance and cleaning is performed on the conveyor belt system. During the change of the conveyor belt, all scrapers blades and rollers are inspected and changed if needed.

Capital Projects

In addition to the maintenance projects listed above, the following Capital Improvement projects included work for Deer Island in FY24:

- Eastern Seawall Design/ESDC Contract 6723
- Fire Alarm System Replacement Design Contract 6904
- Combined Heat and Power Energy Alternatives Contract 6963
- South System Pump Station VFD Replacement Design/ESDC/Resident Inspection Contract 7126
- Radio Repeater System Upgrade Contract 7134
- Clarifier Rehab Phase 2 Design/ESDC Contract 7394
- Clarifier Rehab Phase 2 Construction Contract 7395

- As-Needed Design Phase 8-1 Contract 7501
- As-Needed Design Phase 9-1 Contract 7644
- As-Needed Design Phase 9-2 Contract 7645
- Replace Odor Control Damper Contract 7913

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:

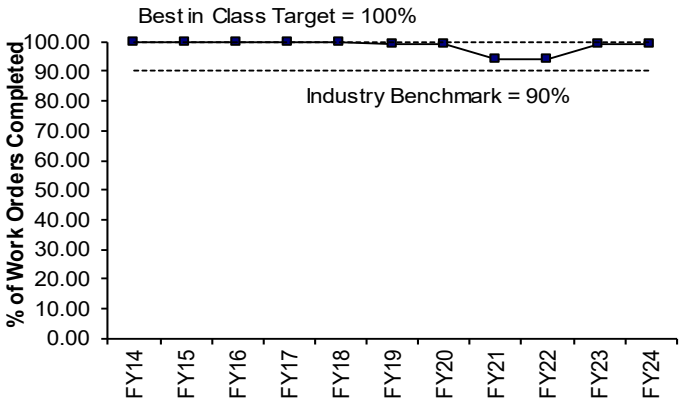
https://www.mwra.com/about-mwra/reports-publications/board-directors-quarterly-report-key-indicators-mwra-performance

Deer Island Yearly Maintenance Metrics

FY24

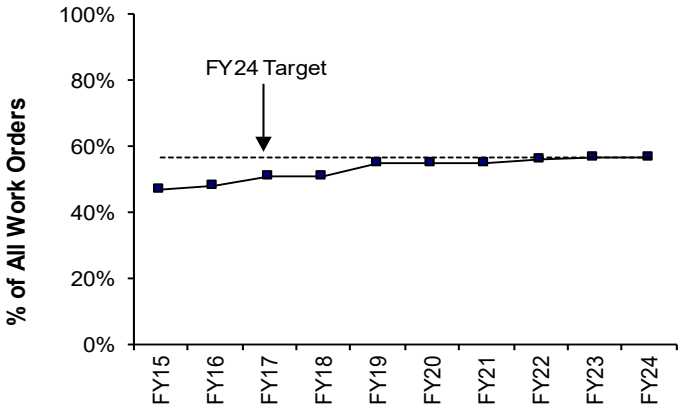
Proactive and Productivity Measures

Preventative Maintenance



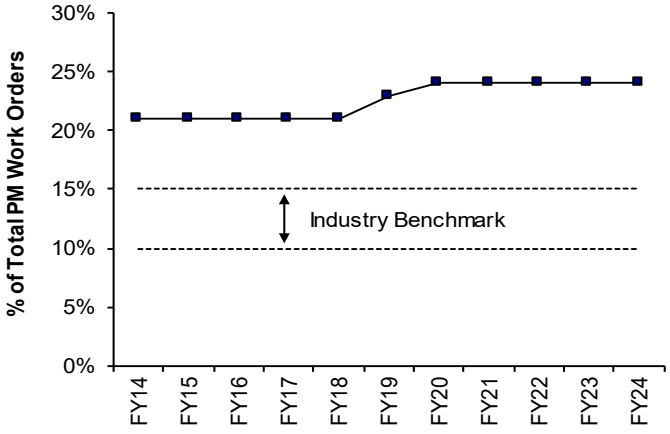
The industry benchmark is 90% for Preventative Maintenance (PM) completion. Upon reaching the 90% goal in FY05, the target goal was increased to the "Best in Class" Target of 100% PM completion. Reliability-Centered Maintenance (RCM) and PM optimization efforts have continued. PM completion rate was 99% in FY24.

Maintenance Kitting



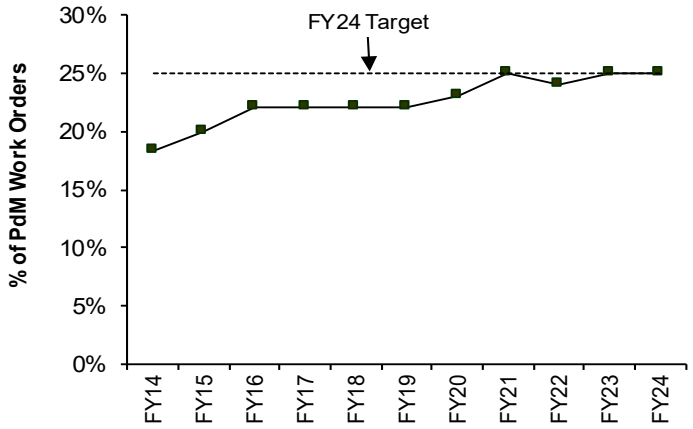
Preventive Maintenance (PM) inventory items were loaded into Maximo to assign spare parts for equipment to PM work orders. DITP reached the PM kitting goal of 100%. In FY12 a new graph was developed to track kitting of all maintenance work orders in an effort to increase wrench time. Staff continues 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 FY24 was 57%, meeting DITP's goal of 57%.

Operations Light Maintenance PMs



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 24% in FY24. DITP reached the industry benchmark range of 15% and has exceeded the goal through FY24.

Predictive Maintenance

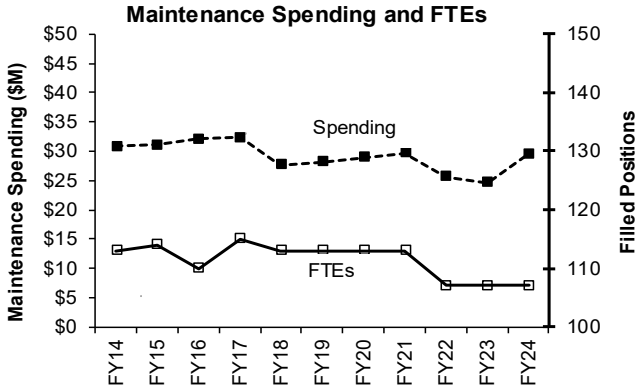


Predictive maintenance has steadily increased from 2% in FY03 to 25% in FY24, DITP met the FY24 goal of 25%. This percentage in predictive maintenance was achieved through the expanded use of lubrication, vibration, thermography, and acoustic ultrasonic testing techniques. The Condition Monitoring Group continually reviews and investigates new opportunities and initiatives to expand condition monitoring testing and analysis.

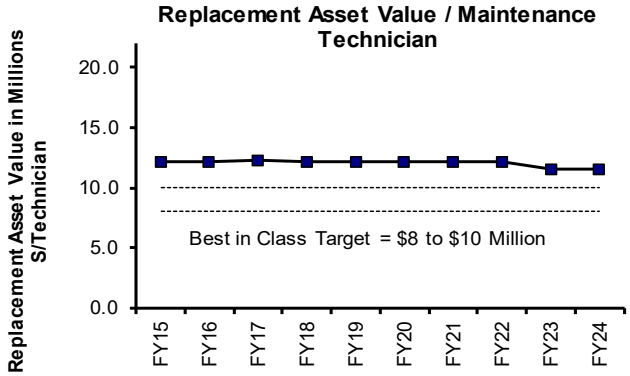
Deer Island Yearly Maintenance Metrics

FY24

Overall Maintenance Program Measures

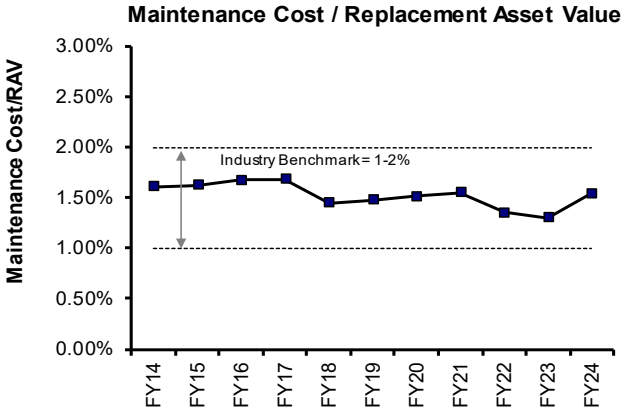


DITP's Maintenance staff is currently at 107 FTE's. Maintenance staff levels ended at 107 due to retirements and hiring challenges for trades personnel. Maintenance has worked to meet our goals though implementation of numerous maintenance efficiencies including: Operations performing light maintenance,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

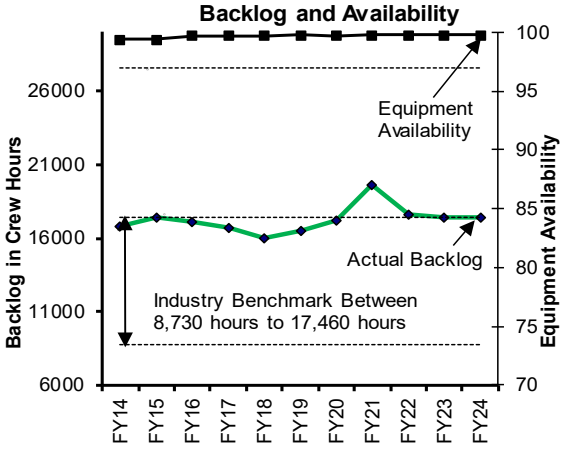


DITP adopted a "best in class" target of $8-$10 Million/Technician for maintenance staffing. DITP remains above this Best in Class. However, as the plant ages and additional equipment replacements are expected, DITP management will reassess staffing as needed.

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 FY24, overall spending increased from FY23 due to the CIP Clarifier Rehab Project Spending. Maintenance staff replaced several electrical conduits, lights, outlets, and eyewash units (EWU) in the sodium hypochlorite containment area. Plumbers removed and replaced all the EWU and associated piping. Plumbing staff utilized Stainless Steel pro-press piping and fittings. Electrical staff removed all old conduit and wiring replacing with new conduits, conductors, LED lights, and outlets. All EWU shower included heat trace wiring. Instrument staff replaced sump pits level indicators. This will allow sump pit alarms to ring through to Primary Operations. HVAC staff changed out one R-410a 70-ton chiller and one Chilled Water Pump for the Digester Gas Cooling system.



The industry benchmark for annual maintenance spending is between 1% to 2% of replacement asset value, currently DITP is at 1.54%. The plant's replacement asset value is calculated at approximately $2.6 billion dollars. DITP's current maintenance spending is the industry benchmark. Overall maintenance spending has increased from last year. DITP Maintenance CEB spending is $24.3 million. CIP spending was $5.1 million (equipment costs only). CIP/CEB Spending totaled $29.5 million in FY24.



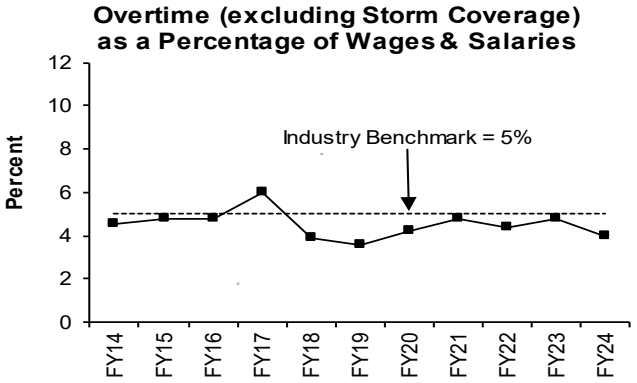
Industry benchmark for Equipment Availability is 97%. Deer Island has exceeded this benchmark over for the last ten years. In FY23 the availability was 99%. The high percentage in Equipment Availability during FY24 is due to redundancy of equipment and effective/efficient maintenance practices.

Industry Benchmark for Backlog is between 8,730 to 17,460 hours for maintenance based on current staffing, the total average backlog for FY24 was 17,411 hours, which is within the industry benchmark. DITP Maintenance has made significant progress to be within the Industry Benchmark.

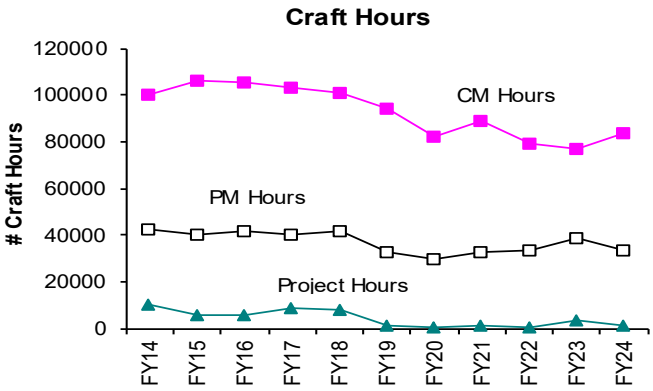
Deer Island Yearly Maintenance Metrics

FY24

Overall Maintenance Program Measures (cont.)



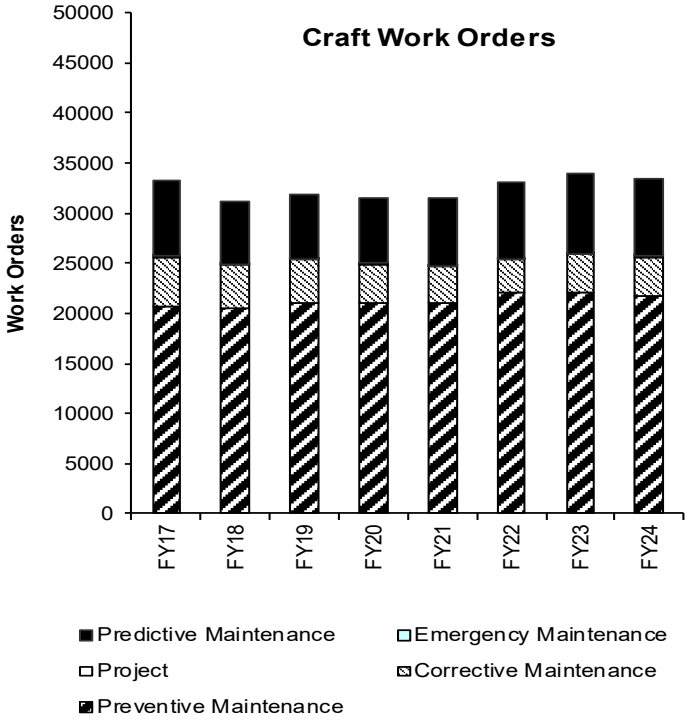
Management continues its effort to keep overtime below the industry benchmark. DITP maintenance overtime was 4.0% for FY24. Management has taken steps to reduce overtime spending by limiting overtime to repair critical equipment and systems only. DITP has been under the Industry Benchmark every year except FY17, due to the increase in overtime for the Eversource Cable Outage.



This year's increase in Corrective Maintenance (CM) hours was due to staff working on Clarifiers and unclogging pumps, grinders and piping due to rags.

This year's slight decrease in Preventive Maintenance (PM) was due to adjusting PM frequencies to meet plant needs. Staff continued to work on optimization of the Preventive Maintenance (PM) program

Maintenance did complete some significant maintenance work in FY24: Staff purchased fourteen low voltage Variable Frequency Drives (VFDs) for the Secondary return sludge system with a 50HP motor. The original VFDs were installed in the late 1990s and are failing, obsolete, and replacement parts are no longer available. DITP Medium Voltage staff installed all VFDs. Residuals staff removed and replaced two digester mixers. The mixers were recommended for refurbishment based upon impeller and bearing wear, which was identified by vibration analyses. Mixers are critical to plant performance. It provides the driving force for mixing the digester content and ensuring a uniform temperature within the sludge mass.
Mechanical staff changed out numerous in-line grinders due to the additional clogging due to wipes in the system.



During FY24, the overall number of work orders slightly decreased from the previous year. 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.

Status Sheets
Wastewater Transport System
July 2023 - June 2024

The Field Operations Department Equipment Maintenance reports on key performance indicators for FY24. 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 FY24, Operations staff completed an average of 360 hours per month, which accounted for 12% of the total preventative maintenance hours.

- 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 FY24, Operations staff completed 100% of the work orders.

- Overall Preventive Maintenance – Both Operation and Maintenance staff complete the preventive maintenance work orders. The goal for FY24 was to complete 100% of all preventative maintenance work orders. The PM completion for FY24 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 FY24 was 63% kitting of all 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 FY24 backlog average was 12,721 hours. This backlog is within 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 $196,711under budget for FY24. 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 FY24, 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. These efforts are supplemented by an Instrumentation Service Contractor who are 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. Continued emphasis is 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."

Facility Maintenance and Equipment Replacement Projects

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.

- Hough's Neck Pump Station: MWRA Facilities staff installed upgraded flood protection barriers, raising the flood protection level of the station.
- DeLauri Pump Station: MWRA maintenance staff replaced the chains on Screen 1, which was in need of replacement due to wear and elongation.
- DeLauri Pump Station: Electricians replaced the VFD for pump number 2.
- Intermediate Pumping Station: Maintenance staff replaced the conveyor belts and rollers for the screenings conveyance system because of broken gearbox and worn belts.
- Braintree-Weymouth Pump Station: Maintenance M&O specialists and Electricians replaced RWW Pump 2 and sent it out to be rebuilt due to a faulty moisture sensor.
- Caruso Pump Station: MWRA HVAC Specialists and Technicians replaced a failed heating coil for the air-handling unit servicing the screen room.
- Caruso Pump Station: MWRA Maintenance staff replaced the Pump 1-4 motor.
- Alewife Brook Pump Station: Staff replaced a grinder.
- Quincy Pump Station: Facilities Staff completed the waterproofing and re-facing of the chimney.
- Prison Point CSO: M&O Specialists and Plumbers replaced the stripping pump.
- Cottage Farm: Plumbers replaced the final effluent sample pump.
- Chelsea Creek Headworks: Maintenance staff assisted the manufacturer in warranty repair work for the Odor Control Fan #2. The work included replacing the fan shaft and bearings, re-alignment of the motor, and balancing the fan.
- Chelsea Creek Headworks: Maintenance staff repaired a broken inline grit screw.

Capital Projects

In addition to the maintenance projects listed above, the following Capital Improvement projects are Construction and Design Projects Started or Ongoing during FY24 Include:

- Nut Island Headworks Odor Control & HVAC Improvements – Construction Contract 7548 (completed)
- Braintree-Weymouth Pump Station Improvements - Construction Contract 7366 (ongoing)
- Remote HW Access Shaft Improvement – Construction Contract 7550 (completed)
- CHE008 Pipe Replacement Construction – Construction Contract 7915 (completed)
- Prison Point CSO Discharge Piping Rehabilitation – Construction Contract 8013 (completed)
- Ward St. & Columbus Park Headwork Design/CA – Contract 7429 (in progress)
- Hayes PS Rehab. Design/CA – Contract 7162 (Design completed. Construction contract BOD approval Oct 2024)
- Siphon Structure Rehab Design/CA – Contract 6224 (100% design in review)
- Interceptor Renewal No. 7 Malden-Melrose Design/CS – Contract 7216 Easement acquisition is in progress, with bidding scheduled for spring 2025.
- Somerville Marginal New Pipe Connection – Contract 7985 (Design completed. Construction contract BOD approval September 2024)
- 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, The construction contract will be reorganized into two separate contracts)

Pipeline Preventative Inspection and Maintenance Projects

The Technical Inspection Unit oversees all sewer inspections and reporting. By analyzing pipeline inspection results and wastewater flow data, the unit schedules maintenance activities to ensure reliable system performance and reduce the risk of blockages or structural failures. Below are examples of key inspection programs and rehabilitation projects carried out during the past fiscal year:

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 FY24, TIU staff inspected 650 manholes. In-house staff rehabilitated approximately 28 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 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 67% of the workload followed by inspections of other structures and manholes. Approximately 32.0 miles of pipelines were TV inspected in FY24.

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 28.34 miles of pipeline and 47 siphons were cleaned in FY24.

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
- 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

Pipeline Rehabilitation Projects

Pipeline Rehabilitation projects are first identified by the TIU during routine 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 FY24:

- 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

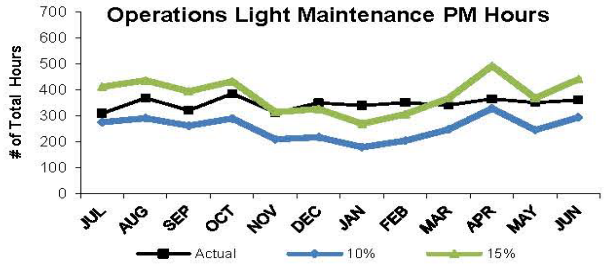
The following pages adapted from MWRA's quarterly performance report to the Board of Directors, the "Orange Notebook", summarize key indicators relating to Wastewater Transport Pipeline Maintenance and Equipment/Facility Maintenance. The full Orange Notebook can be found at:

https://www.mwra.com/about-mwra/reports-publications/board-directors-quarterly-report-key-indicators-mwra-performance

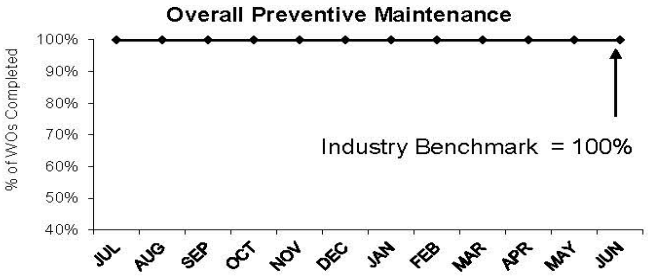
Wastewater Transport

Overall Field Operations' Metropolitan Equipment & Facility Maintenance FY24

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.

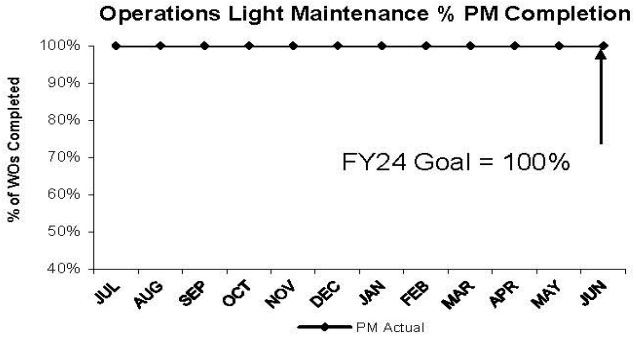


Operations staff averaged 360 hours per month of preventive maintenance during the 4th Quarter of FY24, an average of 12% of the total PM hours for the 4th Quarter, which is within the industry benchmark of 10% to 15%.

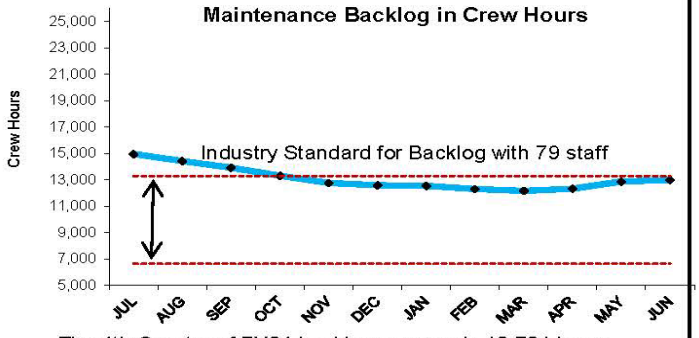


The Field Operations Department (FOD) preventive maintenance goal for FY24 is 100% of all PM work orders. Staff completed 100% of all PM work orders in the 4th Quarter of FY24.

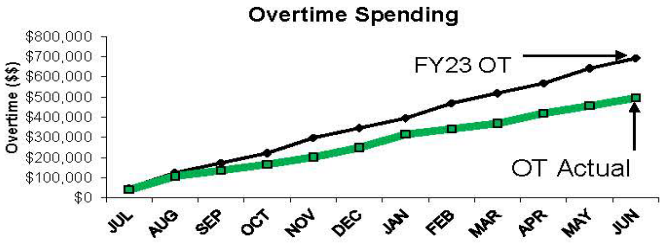
Operations' FY24 maintenance kitting goal has been set at 60% of all work orders to be kitted. Kitting is the staging of parts or material neccesary to complete maintenance work. In the 4th Quarter of FY24, 63% of all applicable work orders were kitted. This resulted in more wrench time and increased productivity.



Wastewater Operations complete light maintenance PM's which frees up maintenance staff to perform corrective maintenance. Operations' FY24 PM goal is completion of 100% of all PM work orders assigned. Operations completed 100% of PM work orders in the 4th Quarter of FY24.



The 4th Quarter of FY24 backlog average is 12,721 hours. Which is within the industry benchmark of 6,636 to 13,275 hours. The current backlog is due to vacancies and several large maintenance projects.



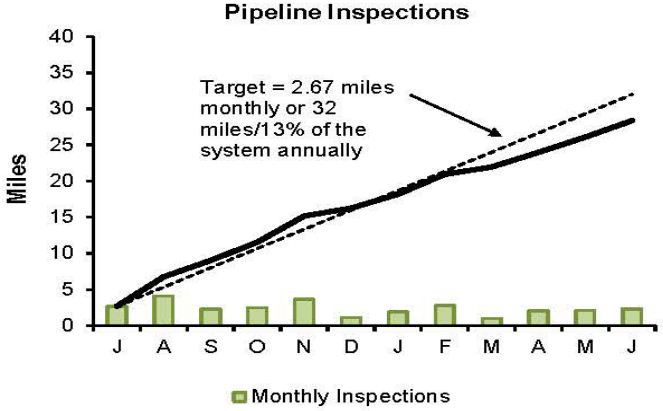
Maintenance overtime was $16,133 under budget on average, per month, for the 4th Quarter of FY24. Overtime is used for critical maintenance repairs and wet weather events. The overtime budget through the 4th Quarter of FY24 is $691,712. Overtime spending was $495,001 which is $196,711 under budget for the fiscal year.

Wastewater Transport

Wastewater Pipeline and Structure Inspection and Maintenance FY24

Inspections

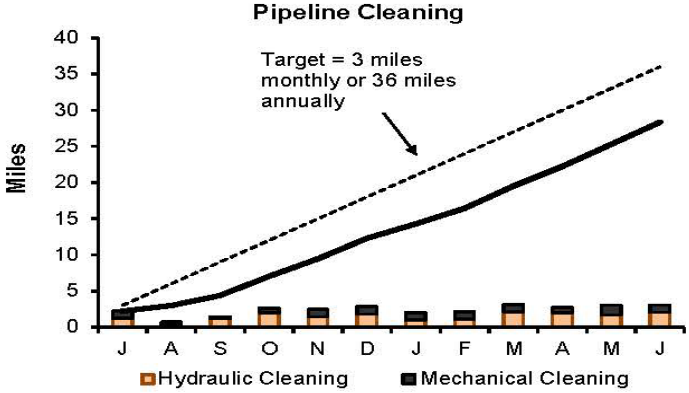
Pipeline Inspections



Staff internally inspected 6.44 miles of MWRA sewer pipe during this quarter.The year to date total is 28.38 miles. No Community Assistance was provided.

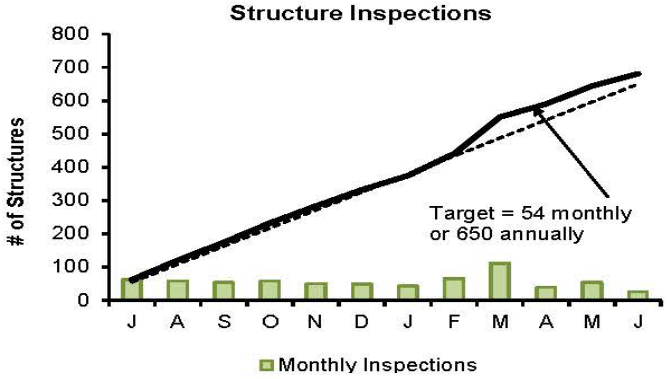
Maintenance

Pipeline Cleaning



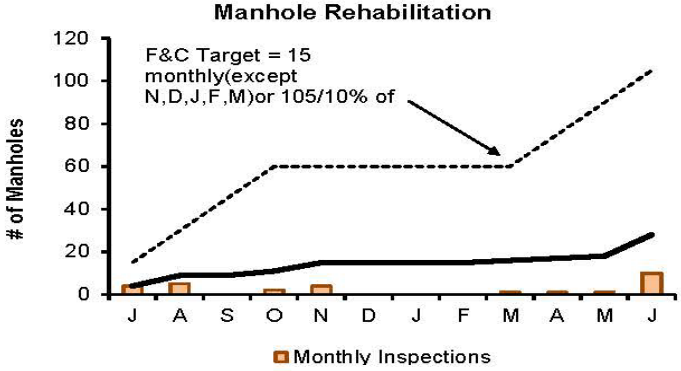
Staff cleaned 8.81 miles of MWRA sewer pipe, and removed 66 yards of grit. The year to date total is 28.34 miles. No Community Assistance was provided.

Structure Inspections



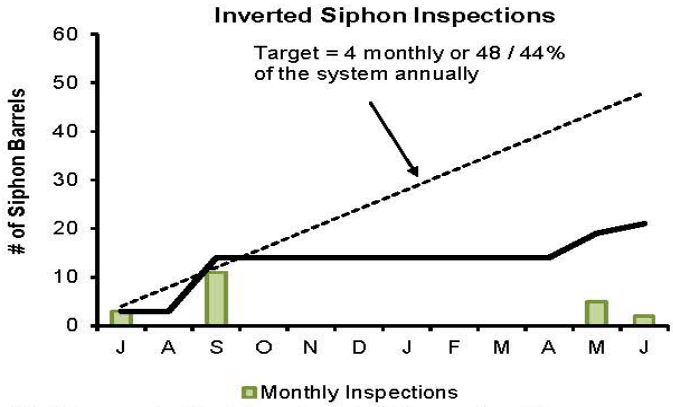
Staff inspected the 36 CSO structures and performed 94 other additional manhole/structure inspections during this quarter. The year to date total is 681 inspections.

Manhole Rehabilitation



Staff replaced 12 frame and cover replacement this quarter.The year to date total is 28.

Inverted Siphon Inspections



Staff inspected 7 siphon barrels this quarter. The year total is 21 inspections.

Inverted Siphon Cleaning

Staff cleaned 9 siphon barrels this quarter.

Annual Status Sheets-Fore River Pelletizing Plant
July 2023 – June 2024

Fore River Maintenance reports on Key Performance Indicators for FY24.

Maintenance Work Orders and Backlog:

- Maintenance Backlog - In FY24, there were 1,824 work orders created in the eMaint CMMS, 1,081 of those were PM's, 204 were planned, 490 were unplanned and 52 were listed as safety work orders. As of 7/1/24, there were 306 open work orders, 102 of them PM's representing 83.2% completion rate. Currently, there are still 204 FY24 work orders outstanding, primarily long-term identified corrective/improvement WOs.

- Preventative Maintenance - 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.

Critical Equipment Availability: 83.33%

Operating logs indicate that of the 2,190 machine days in FY24, centrifuges were available for 1,460 days for an availability of 83.33%. Two rotating assemblies were at the OEM repair shop for a total of 215 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 it can be sent through a bypass system to trucks and taken to a landfill. The primary driver of downtime was disassembly and cleaning of the rotating assemblies. Now, 10 of 12 centrifuges are available, giving the Plant more than enough capacity to process flows from Deer Island. The facility is currently operated on a 5-day workweek ceasing operations on most weekends.

Maintenance Projects and Equipment Replacement:

More than $1.40 million was spent on replacement parts and maintenance related items in FY2024, including:

- Replaced train 2 Mixer B screw after break due to corrosion
- Completed major repairs to the outlet of Drum 2, the head sheet and turn plates
- Replaced 45° elbows on silos 1-5 transport line
- Replaced ceramic media in two of four RTO's
- Centrifuge repairs – two complete rotating assembly 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 completed