



STAFF SUMMARY


TO: Board of Directors
FROM: Frederick A. Laskey, Executive Director 
DATE: May 24, 2023
SUBJECT: Metropolitan Water Tunnel Program Update

COMMITTEE: Water Policy and Oversight

X INFORMATION
 VOTE


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Preparer/Title


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RECOMMENDATION:

For information only. This staff summary provides a review of the needs for the Metropolitan Water Tunnel Program, an update on the Program activities, and a review of the financial considerations for the Program.

DISCUSSION:

On February 5, 2017, the Board of Directors approved construction of northern and southern deep rock water supply tunnels to provide needed redundancy for the Metropolitan Tunnel system. The Board directed staff to proceed with preliminary design, geotechnical investigations and Massachusetts Environmental Policy Act review of the project.

This decision was the culmination of a series of meetings that started with a Special Meeting of the Board of Directors on October 6, 2016, at which staff provided a briefing on the status of the existing MWRA water transmission system and the lack of redundancy for the City Tunnel (1950), City Tunnel Extension (1963), and the Dorchester Tunnel (1976) with an accompanying binder of supporting materials.

- Staff concluded that the tunnels and shafts themselves require little or no maintenance and represent a low risk of failure. However, the cast iron, steel pipe and valves at the tops of the shafts are in poor condition and are in need of rehabilitation and maintenance.



Figure 1 – Condition of Some Existing Tunnel System Valves

- Failure at the tops of shafts in the existing system could result in widespread outages of water service, impacting 60% of the service area which would require activation of emergency backup sources of supply, water use restrictions, pressure swings, and a boil order.

The economic impact to the metropolitan region was determined through Federal Emergency Management Agency methodology to be on the order of \$300 million per day (2016).

- Staff presented financial considerations of advancing a capital program to address metropolitan tunnel redundancy with the goal of:

- preserving sustainable and predictable rates at the water utility level
- ensuring adequate capital is available when necessary, and
- minimizing the cost of borrowing

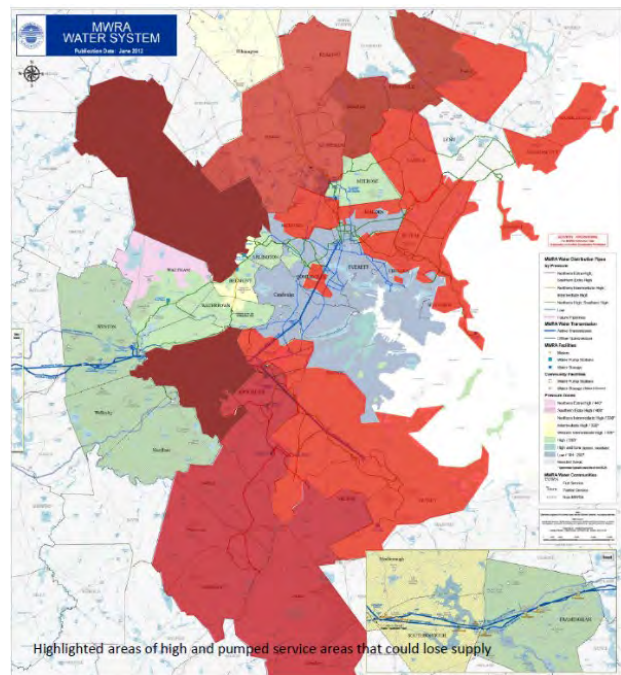


Figure 2 –Impact of Metropolitan Tunnel System Shutdown

At the conclusion of the Special Meeting, staff were directed to brief member communities and state and local officials in order to build consensus and support.

The MWRA Advisory Board hosted a Long-Term Redundancy Forum on December 8, 2016 at which staff presented the history of the MWRA waterworks system, the need for Metropolitan Tunnel redundancy and the challenges, both implementation and financial, of building redundancy. The Honorable Jeanette A. McCarthy, Mayor of Waltham provided the perspective

of local communities on the potential for impacts and disruption. On January 19, 2017, the MWRA Advisory Board met and voted to support moving forward with the deep rock, two-tunnel project, utilizing a Program Management Division Approach, similar to the model used for the Boston Harbor Project; and concurrent construction of both tunnels, rather than a phased approach.

Interim System Improvements

Staff developed a series of capital improvement projects to both reduce identified risks in the existing system and provide for better response capabilities in the event of a system failure before the new tunnels are constructed. Several projects have been identified to strengthen existing structures and provide additional operational flexibility and redundancy. Two construction contracts have been completed, providing flexibility and redundancy at the Commonwealth Avenue Pumping Station, and strengthening the top of shaft structures and components at the Top of Shafts 6, 8 and 9A. Three construction contracts are in progress:

- Construction Package 1 (CP1) – rehabilitation of two-plus miles of 56 and 60-inch diameter steel pipe along the eastern end of Weston Aqueduct Supply Main 3 (WASM3);
- Replacement of Pressure Reducing Valves to allow the Northern Low Service pipelines to operate at increased grade lines to supply additional flow to the Spot Pond and Gillis Pumping Stations in an emergency condition with the tunnel system out of service; and
- Section 101 extension to provide sufficient capacity to maintain water service to Waltham during the anticipated shutdowns of WASM 3 and the Lexington Street Pumping Station for future rehabilitation.



Figure 3 – Protective coating for top of shaft appurtenances

A second WASM construction contract to rehabilitate the middle portion of WASM 3 is in final design. Two construction contracts are currently in final design at Shaft 5 and include strengthening exposed pipe and valve bodies, and replacement of nuts and bolts on shaft caps and flange connections, and building improvements. Similar improvements to Shafts 7, 7B, 7C and 7D are in preliminary design phase. A future contract is planned to rehabilitate the remaining length of WASM 3.

Tunnel Program Update

The Tunnel Program consists of a North Tunnel and a South Tunnel. The North Tunnel will include a completed tunnel from the I-90/I-95 Interchange to a connection to WASM 3 in Waltham (Segment 1). The South Tunnel will include a completed tunnel that can be isolated in two segments: from the I-90/I-95 Interchange to the Highland Avenue/I-95 interchange in Needham (Segment 2) and from there to the American Legion site in Mattapan near Shaft 7C of the Dorchester Tunnel (Segment 3). Each tunnel will include two to four intermediate shafts that allow for connections to existing MWRA or community infrastructure. The current tunnel alignment differs slightly from that initially proposed in 2016 in that it no longer includes a connection shaft near the Commonwealth Avenue Pumping Station in Newton (along the City Tunnel), but rather

provides for connections to community pumping stations in both Wellesley and Needham for much needed redundancy to MWRA’s Section 80 pipeline. Figure 4 shows the current preliminary tunnel alignment, limits of segments and shaft sites.

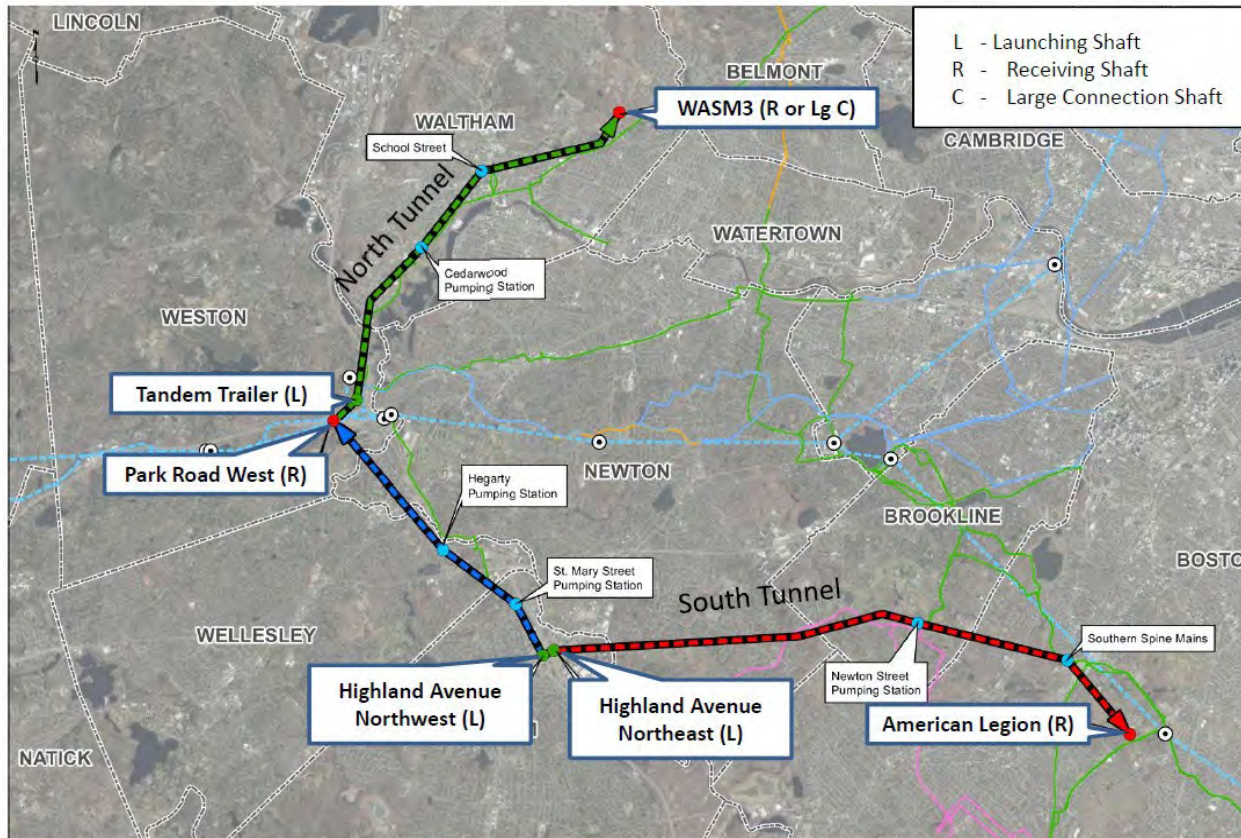


Figure 4 – Preliminary Tunnel Alignment (DEIR Alternative 4)

In addition to the shaft sites at Street Mary Street Pumping Station and Newton Street Pumping Station that the Authority currently owns, in September 2021 the Board approved and the Authority purchased a parcel of land along School Street in Waltham for a connection shaft site. Staff are currently working with the remaining shaft site landowners (MassDOT, DCR, UMass, Wellesley and Waltham) on land access and acquisition.

The Tunnel Program is currently in the preliminary design phase, which will end in early January 2024. Final design is anticipated to start in 2024 with a target for the first tunnel construction contract bidding in 2027. Program completion is anticipated by 2040.

Awarded and Future Contracts

Currently three professional services contracts and one real estate lease have been approved by the Board and executed in support of the Tunnel Program. The professional services contracts include:

- Program Support Services (PSS), which provides general consulting, submittal review, risk management support, constructability reviews, cost estimating/validation, schedule support, staff augmentation, and Expert Review Panel (ERP) engagement support;
- Preliminary Design, which consists of the execution of initial geotechnical investigations, preparation of Environmental Impact Reports, and preparation of a

- Preliminary design report, drawings, schedule and cost estimate; and
- Geotechnical Support Services, which focusses on the collection of geotechnical/geological data to support final design, bidding and construction of the Program.



Figure 5 – Preliminary Geotechnical Investigations

Last December, a 10-year real estate lease was approved by the Board and executed by the Executive Director for approximately 19,000 square feet of warehouse/flex space in Needham for the processing and storage of geotechnical samples (primarily rock core) that is needed for the Program. The space also provides some office and meeting space for Program use.

Additional professional services and construction contracts are planned in support of the Program. Those include an extension to the PSS contract, Final Design and Engineering Services During Construction, and Construction Management. At this time, two or possibly three tunnel/shaft/near surface facility construction contracts are planned. It is likely that a few enabling construction contracts will be needed to facilitate the overall Program schedule.

Environmental Impact Report (EIR) Status

Staff submitted an Environmental Notification Form (ENF) to the MEPA Office for public comment in March of 2021. The ENF included an Alternatives Screening Report that documented the comparison and selection of the preferred two-tunnel concept to other surface pipe and tunnel alternatives. The Secretary of Energy and Environmental Affairs (EEA) issued a certificate on the ENF that requires the submittal of a mandatory Draft Environmental Impact Report (DEIR).

Staff submitted a DEIR to the MEPA Office for public comment on October 22, 2022. The DEIR evaluated the preferred alternative (Alternative 4) along with the two backup alternatives.

The DEIR included information on the following topics for the three DEIR Alternatives:

- Project Description and Permitting;
- Public Outreach/Environmental Justice;
- Alternatives Analysis;
- Land Alteration, Open Space, Wetlands, Rare Species Habitat, Cultural and Historical Resources;
- Water Management Act/Water Supply;
- Climate Change (adaption and resiliency, greenhouse gas emissions);
- Construction Period; and
- Responses to ENF Comments.

Alternative 4 was selected as the preferred alternative in large part because it provides the most flexibility for construction and the shortest overall construction schedule. The DEIR also included Mitigation and Draft Section 61 Findings, as required by MEPA.

EEA issued a certificate on the DEIR that requires the submittal of a Supplemental Draft Environmental Impact Report (SDEIR) before the Program can proceed to the Final EIR phase. Specifically, the SDEIR is to address the validity of the proposed North Tunnel receiving shaft site at the Fernald Property in Waltham, which was common to all three alternatives included in the DEIR, and to analyze and present any potential alternate receiving shaft locations. In addition, the SDEIR is to respond to comments on the DEIR received as part of the public comment and to supplement Environmental Justice and Greenhouse Gas analysis presented in the DEIR.

Staff are currently working to address comments regarding the DEIR and prepare a SDEIR that will present two new shaft sites for the end of the North Tunnel with the intention to file in summer 2023.

Community and Stakeholder Outreach

Staff have implemented a communication plan to ensure that communities and stakeholders are informed as to the importance of this effort and what can be expected in the years ahead. Staff have contacted all ten communities within the Program Study Area and have formed a working group, which includes representatives of each of the ten communities, the MWRA Advisory Board, the Water Supply Citizens Advisory Committee and the Metropolitan Area Planning Council. These working group members participate in regular meetings with the Program Team to be kept informed on progress, and provide input on certain elements of the Program. The goals of the working group meetings are to provide a collaborative and transparent process for evaluating alternatives and yield more informed comments during the MEPA process. The working group has met six times since it was formed in April 2021.

Staff are holding additional meetings with community representatives from the seven municipalities where the tunnel will be constructed. Coordination meetings with public safety personnel from several communities has begun and will continue through design and construction to ensure the safety of the public who may be impacted by the Program as well as the workers who will construct the tunnels.

Multiple fact sheets covering a variety of topics have been created for the Program and translated into four languages. A program website is available for additional information at <https://www.mwra.com/mwtp.html>.

Program Financial Considerations

The estimated cost of the Tunnel Program has evolved as information and time have progressed. During the early presentations to the Board, the Advisory Board, stakeholder groups and Finance staff used an estimate of \$1.1 billion to model debt service and assessment impacts. As more refined estimates became available, staff used an estimate of \$1.341 billion, representing the average of two possible alternatives. Staff averaged Alternative 2A - two tunnels, one to the north and one to the south, totaling 14 miles with an estimated cost of \$1.183 billion and Alternative 3D - also two tunnels, though further to the north to Shaft 9A in Malden and south to Shaft 7C, totaling 18.2 miles with an estimated cost of \$1.499 billion.

The Tunnel Program was first included as Project #625 in the Fiscal Year 2017 Proposed Capital Improvement Program (CIP). Project #625 as proposed was revised from earlier alternatives to include additional sub-phase work on the WASMs, the Wachusett Aqueduct Pumping Station and other improvements. The Fiscal Year 2017 CIP, Project #625 included an estimated project cost of \$1.429 billion plus \$41 million related to inflation. For Fiscal Year 2018, the additional sub-phases were moved from Project #625 to a different project reducing the cost to \$1.259 billion plus \$99 million for inflation. Annually, the Project cost estimate is revised to reflect updated amounts due to contract awards, design progress, revised estimates and inflation. Presently, the Fiscal Year 2024 Proposed CIP includes an updated estimate for Project #625 of \$1.461 billion plus \$334 million for inflation (\$1.8 billion).

Staff continue to assume the Program will be financed with long-term tax exempt bonds. The debt service for these bonds is modeled based on the current CIP estimated cost, estimated interest rates and amortization. The resulting modeled debt service is included in the Current Expense Budget (CEB) projections. As Project spending increases with the commencement of construction, short-term temporary capitalized borrowings may be advantageous. Staff will continue to monitor Project specific spending and the rate of overall spending from the Construction Fund and will make the evaluation as to long or short-term borrowings as it becomes necessary.

Each fiscal year as the CEB recommendation is developed, staff iteratively monitor the necessary revenue from community assessments. All additions, deletions and revisions to the CEB are evaluated for the impacts to the rate of increase to the assessments. The Fiscal Year 2024 Proposed CEB resulted in a 3.9% increase to the Water Utility assessment and the model projected a 3.9% increase for Fiscal Years 2025-2028. This proposed increase and the projected increases include the impact of the modeled debt service associated with the Project included in the Fiscal Year 2024 Proposed CIP.

BUDGET/FISCAL IMPACTS:

The proposed FY24 CIP includes \$1.8 billion for the Metropolitan Water Tunnel Program. This budget will be refined at the completion of Preliminary Design.



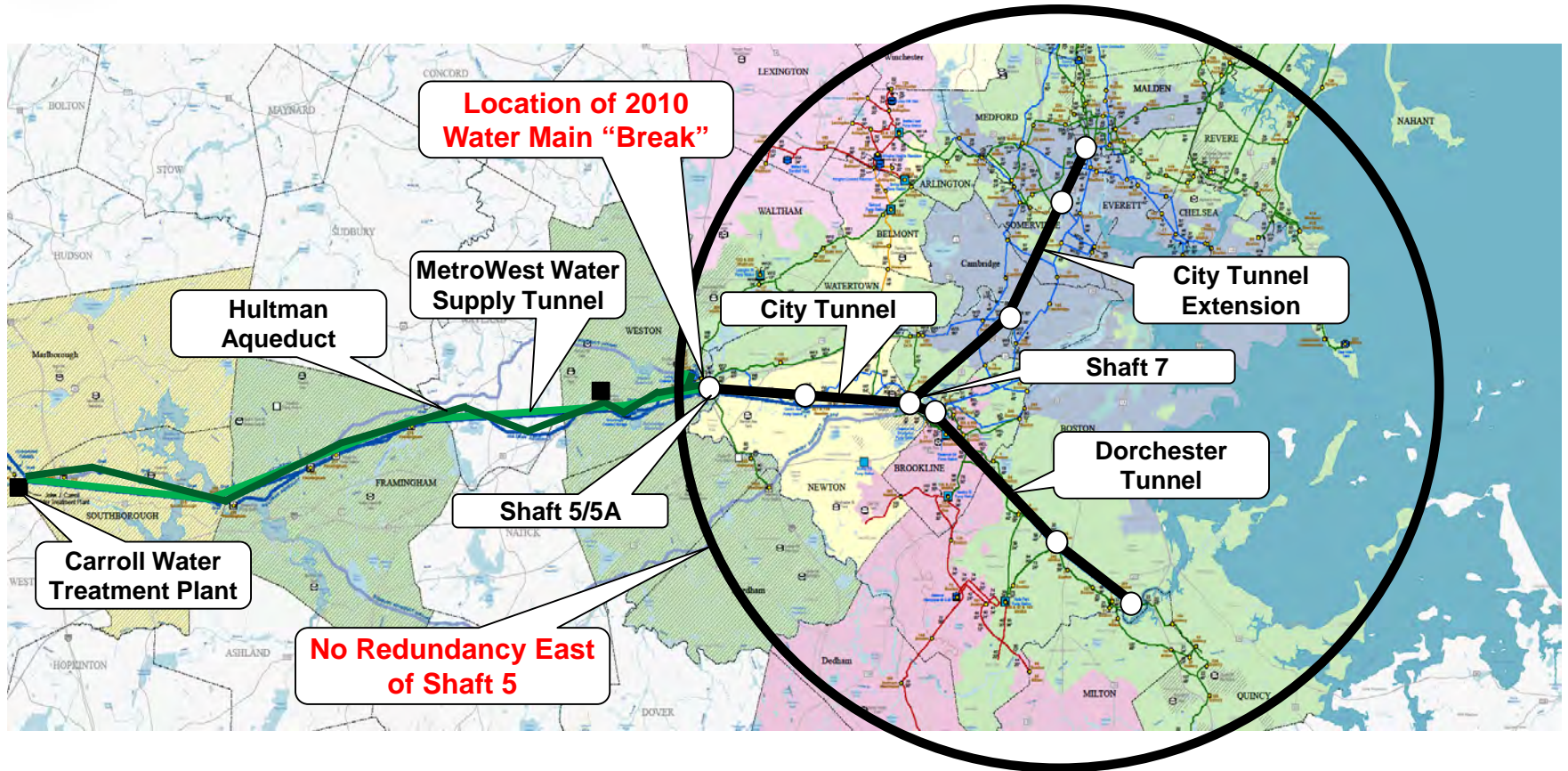
Metropolitan Water Tunnel Program

Update

May 24, 2023



Metropolitan Tunnel System Serves About 60 Percent of Water Demand in Metropolitan Area





Need for Repair

- The tunnels, valves, chambers & pipelines are between 50 – 75 years old

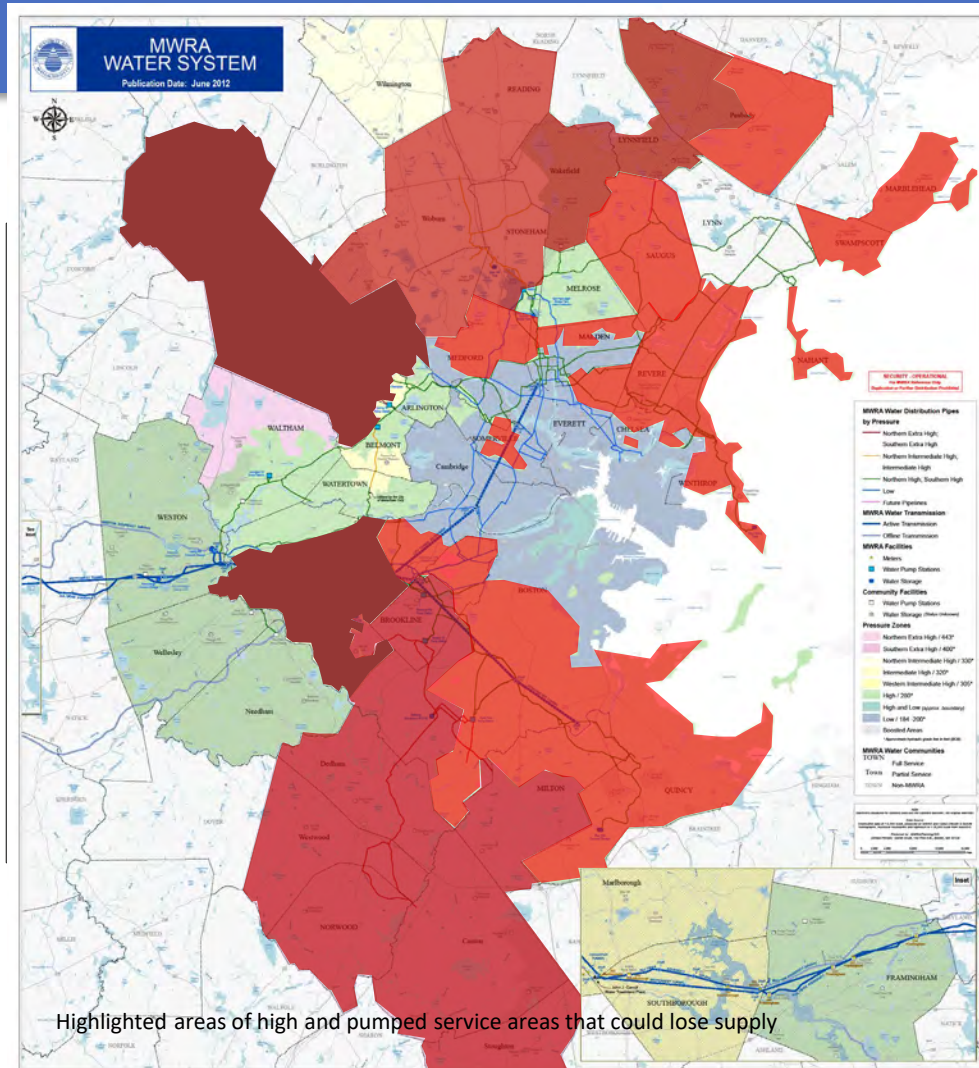


- Corrosion, inoperability, leakage, standing water; all impact reliability of the system
- Cannot shut down to repair/replace
- Severe service impacts if shut down necessary



Wide-Spread Impact

- Sudden shut down of Metropolitan Tunnel system
- Loss of supply to high service areas
- Pumped Service Areas lose supply as tanks empty
- Whole system would be on boil order





Metropolitan Water Tunnel Program Goals

Protect Public Health, Provide Sanitation and Fire Protection

- Provide full redundancy for the Metropolitan Tunnel System:
 - Provide normal water service and fire protection when the existing tunnel system is out of service
 - Provide the ability to perform maintenance on existing tunnels year-round
 - Provide uninterrupted service in the event of an emergency shut down
 - Meet high day demand flow with no seasonal restrictions
 - Avoid activation of emergency reservoirs
 - Meet customer expectations for excellent water quality
- Result in no future boil orders!



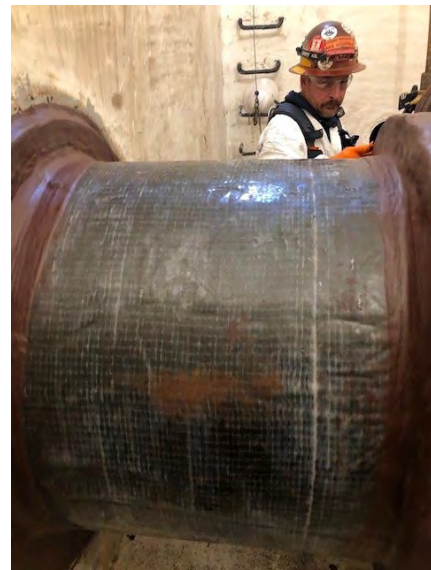


Interim Improvements Underway

- Projects to:
 - Reduce risk of failure/breakdown
 - Improve access for emergency use
 - Improve response capabilities
- Nearly \$40M in projects completed or underway:
 - Top of shafts improvements (1 phase complete)
 - Commonwealth Avenue Pump Station improvements
 - WASM 3 Rehabilitation (1 phase nearly complete)
 - PRV improvements (nearly complete)
- Several projects being designed



Interim Improvements Underway





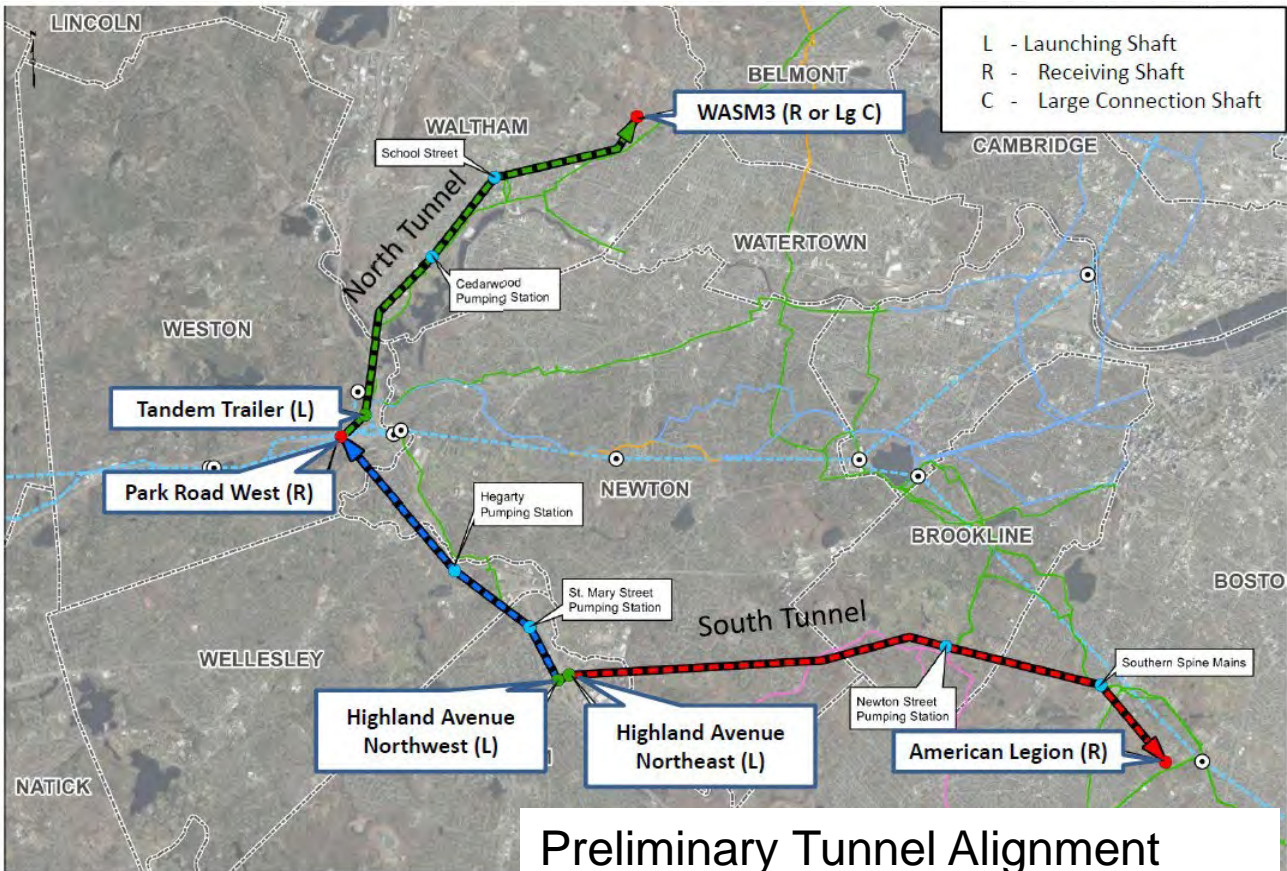
Metropolitan Water Tunnel Program

Construction Shaft Sites

- WASM3, Waltham
- I90/I95 Interchange, Weston
- Highland Ave/I95 Interchange, Needham
- American Legion, Boston

Connection Shaft Sites

- School St - Lexington St Pump Station, Waltham
- Cedarwood Pump Station, Waltham
- Hegarty Pump Station, Wellesley
- St. Mary Street Pump Station, Needham
- Newton Street Pump Station, Brookline
- Southern Spine Mains, Boston



Preliminary Tunnel Alignment
(DEIR Alternative 4)



Tunnel Program Schedule

- Overall Program Schedule
 - Preliminary Design is ongoing thru early Jan 2024
 - A large geotechnical investigation is about to start and run thru 2025
 - Targeting Final Design to start in mid 2024
 - Targeting first tunnel construction contract to bid in 2027
 - Program completion by 2040
- Current Design Status
 - Geotechnical investigations
 - Environmental Impact Reports
 - Preliminary Design Report
 - Establish contract packages
 - Refine Program cost and schedule (to be reflected in FY25 CIP)





Contracts

Awarded Contracts	Value	Duration	Dates
Program Support Services (PSS)	\$10,247,877	5 years, renew in 2024	May 2019- May 2024
Preliminary Design	\$15,692,527	3.5 years	July 2020 - January 2024
Geotechnical Support Services	\$12,789,889	3 years	January 2023 – January 2025
Rock Core Storage Facility	\$6,950,000 (base annual rent) + taxes and operating costs	10 years w/ option to renew	April 2023 – April 2033

Future Contracts	FY24 CIP (actuals TBD)	Duration	Dates
PSS Extension	\$3.5M & \$3.75M	Two 2 year extensions	2024 - 2028
Final Design & ESDC	\$114M	>10 years	Target NTP mid-late 2024
Construction Manager(s)	\$149M	>10 years	Target NTP mid 2026
Enabling Construction Contracts	TBD	TBD	TBD
2 or 3 Tunnel Construction Contracts	\$1.3B	5 to 8 years each (estimated)	Btwn 2027 - 2040
TBD	TBD	TBD	TBD



Design Status

- 1st Draft Preliminary Design Report and Drawings are done
- Currently undergoing reviews
 - MWRA Operations, Tunnel Dept, PSS/SME
 - Expert Review Panel
 - Optimization Workshop
- 1st Preliminary Bottom-up Cost Estimate is pending
- Final Design will start in 2024
- One Final Design contract
 - Maintain design consistency between construction packages
 - Better management of overall design schedule / flexibility





Status of Environmental Impact Reports

- ENF was submitted in March 2021
 - Certificate received in May 2021
- DEIR was submitted in October 2022
 - Certificate received in December 2022
- SDEIR plan to submit in summer 2023 } Unplanned
 - Respond to comments
 - Expand EJ and GHG analysis
 - Alternate North Tunnel end point
- FEIR plan to submit in late 2023/very early 2024
- Goal is to maintain overall Program schedule even with an additional EIR submittal



Alternate North Tunnel End Point

- Due to comments made by the City of Waltham on the DEIR regarding concerns over the preferred North Tunnel end point at Fernald Property, alternate end points for the North Tunnel were evaluated:
 - Lower Fernald Property (Waltham property)
 - 225 Beaver St (UMass property)
- Both alternate end points connect to WASM3
- Both end points will be included in the SDEIR
- The UMass shaft site will be the new preferred North Tunnel end point



Community and Stakeholder Outreach

- Met with all 10 communities in the original study area
- Ongoing meetings with Working Group - representative from each community
- Met with departments from key communities in which the tunnel will be constructed:
 - Town Management, Public Works, Public Safety/Fire Dept, Con-Com, etc.
- Met with key stakeholders:
 - EEA, MassDOT, DCR, UMass, DPH, DYS and DCAMM
- Met with numerous organizations, businesses and private property owners to coordinate field work
- Program Website <https://www.mwra.com/mwtp.html>
- Multiple Fact Sheets – translated into 4 languages
- Outreach will continue throughout design and construction



Program Finances

- Finance Division staff are continuously updated on progress and developments
- The Proposed CIP is updated in the Fall
- The Draft Final CIP is updated in the Spring



Program Finances continued

- The CIP data is integrated in to the CEB computer Model
- Based on amounts and timing of CIP expenditures, the Model creates borrowings and debt service schedules
- The debt service schedules are incorporated into the CEB
- Assessment amounts and rate of change each year are modeled
- Rate projections have incorporated the Tunnel project since first appearing in FY 2017