Green Line Capacity Improvements

Fiscal and Management Control Board

April 24, 2017
Overview

- Facts and Figures
- The Existing Infrastructure and Vehicles
- The Strategy for Increasing Capacity on the Green Line
- Short Term Improvements
- Mid Term Improvements
- Future Improvements
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Green Line
Facts and Figures
Key Facts

- Over 200,000 trips each weekday—the nation’s busiest light rail line
- 66 Stations
- 200 Fleet Cars
- Allocated fare revenue of $73,950,058
- Right of Way
  - 31 track miles (yard + revenue)
  - 82 switches
  - 5 miles of tunnel section
  - 51 traffic signalized intersections
Green Line Reliability Performance

The Existing Green Line Infrastructure and Vehicles
Infrastructure is Varying in Age and Installation Date
Assets Overview

- 18 ventilation shafts
- 38 ventilation fans
- 235 miles of power cable
- 19 power substations
- 165 wayside signal equipment cases
- 241k tons ballast, 131,225 rail ties, and 5.2 miles of tunnel; 82 switches
- 94 accessible Type 8 cars
- 102 Type 7 cars (require a mobile lift to board)

*Drawing not to scale*
The Strategy for Increasing Capacity on the Green Line
Optimal service delivery means trains arrive within their scheduled headway, and with enough space for all passengers to board.

- **Optimal Service Delivery**
  - Reliability
    - Planned schedule
    - Dispatch efficiency
    - Improve run time
    - Policy constraints
  - Carrying Capacity
    - Infrastructure upgrades
    - Vehicle design and quantity
Tactical Toolbox

Service Changes
- Run time and reliability changes
- Frequency and span changes

Operational Changes
- Improved dispatching tools and procedures

Capital Investments
- Additional vehicles
- Infrastructure investment

Partnerships with municipalities
- Signal Prioritization
- Signal Phase Optimization

Private sector partnerships
- Technical Analyses
Short Term Improvements
Service Planning Improvements

Goal
Increase reliability and capacity along the Green Line.

Solution
Investment to the Government Center and updated service planning.

Status
Government Center opened in March 2016. Run time and reliability analyses are completed at each service change.

Result
Spring Rating (March 2016) opening of Government Center. A concurrent run time and reliability analysis was completed and service changes were implemented late March 2016. A second run time and reliability analysis was completed and changes were implemented.

Next Steps
Continued service changes.
Transit Signal Prioritization

Goal

Improve run time for passengers.

Solution

Extend green light for Green Line as it approaches intersections.

Status

Active at 4 intersections on B and E branches. C branch active testing underway.

Partners

Boston and Brookline.
Transit Signal Prioritization

Expected Result

Travel time savings of 0:30/trip for B branch customers. C and E branch time savings estimates under review.

Next Steps

Completed testing in Boston and Brookline in June 2017.

Roll out to all applicable intersections as server space allows through Fall 2017.
Signal Phase Optimization

Goal

Improve run time for passengers.

Solution

Change signal timing to give priority for left-turning cars.

Status

Analysis underway for 6 Commonwealth Avenue intersections.

Partners

Boston, Brookline and MassDOT.
Signal Phase Optimization

Expected Result

Travel time savings of 0:10/trip average for B branch customers.

Next Steps

Develop implementation plan with Boston and MassDOT Highway Division.

Complete analysis for Beacon Street and Huntington Avenue.
Mid Term Improvements
Surface Station Consolidation

Goal
To enhance reliability and run times.

Solution
Consolidate stations that are within a close proximity. Consolidate four stations into two stations along the B Green Line corridor.

Status
Station consolidation is to be completed in 2019.
Surface Station Consolidation

Partners

Boston and Brookline.

Expected Result

Travel time savings of 0:20/trip average for B branch customers.

Next Step

Work with Boston and Brookline to identify additional surface station consolidation candidates.
Real-Time Tablet Application Pilot

Goal
To dispatch trains more evenly, thus improving reliability.

Solution
Empower officials with real-time information and up-to-the-second departure recommendations.

Status
Successful pilot completed at Riverside Terminal in March 2017.

Partner
MIT
Real-Time Tablet Application Pilot

Poor Headway Control - Monday, March 6, 2017

- Departed within 10 seconds of schedule
- Departed more than 1 minute ahead of recommendation
- Previous train departed 1 minute late
  - Result: Uneven headways enlarge along route
- Departed 30 seconds behind schedule
- Departed 1m15s behind recommendation
  - Result: Larger headway ahead leads to longer dwells, running time—following train comes 1 minute behind by Fenway
Good adherence consecutively leads to reduction in holding at downstream stations, evenly-spaced service.
Real-Time Tablet Application Pilot

**Results**
When the pilot was in full effect, headway variability decreased by 42% as experienced by passengers at surface stops.

**Next Steps**

**Short Term:**
Create a tablet application that will show real-time train arrivals at terminals, by June 2017.

**Longer Term:**
CIP request was approved for software/user interface component to roll out to all officials. MIT will continue to develop and test algorithms. Anticipated roll out in 2019.
Long Range Customer Demand Study

Goal
Explore initiatives for improving capacity beyond vehicle and infrastructure upgrades.

Solution
Understand opportunities to improve capacity through partnerships. Strengthen existing partnerships and identify action items to improve capacity.

Status
Complete by mid/late 2018.

Partner
MassDOT Planning
Long Range Customer Demand Study

Expected Result
Future Green Line passenger demand baseline.

Identification of opportunities to improve capacity and reliability, working with partners.

Next Step
Continued partnership with MassDOT Planning and partners along the Green Line corridor.

Source: MAPC
Future Improvements
**Goal**
Increase connectivity and capacity along the Green Line.

**Solution**
Extend the Green Line from Lechmere to College Avenue in Medford.

**Status**
Construction schedule is 43 months.

**Partner**
MassDOT, City of Somerville and Federal partners.
Green Line Extension and Type 9 Cars

Expected Result

- Green Line is extended 4.5 miles, with 6 new transit oriented stations.
- 20% of population of Somerville is within walking distance of rail transit today, and 80% is anticipated to be so with extension of the Green Line.

Next Steps

- Continued planning and construction based on schedules.
- Service planning and scheduling in anticipation of new service delivery along the extended line.
Infrastructure and Future Vehicles

Goal
Model of service improvements possible under different Type 10 car types and infrastructure upgrade scenarios.

Solution
Analyze the Green Line, using simulation models to test operational approaches to enhanced service delivery.

Status
Project to begin in May 2017. Completion expected by April 2018.

Partner
LTK Engineering
Infrastructure and Future Vehicles

Expected Result
Technical analysis of benefits based on the application of various operational scenarios for future light rail vehicle types and infrastructure upgrades.

Next Step
Work with LTK and partners to complete Green Line Study and develop a proposed project list based on operational scenarios.
In Summary
## Timeline for Improvements

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- Study Complete
In Summary

The Green Line is the nation’s busiest light rail system.

The Green Line has unique characteristics and elements that require specific approaches for improvement.

We have a strategy to improve infrastructure and vehicles on the Green Line.

We are using our tactical toolkit to implement initiatives to support improvements.

Service Changes
Operational Changes
Capital Investments
Partnerships with Municipalities
Private Partnerships