



# MBTA Commuter Rail Schedules Initiative

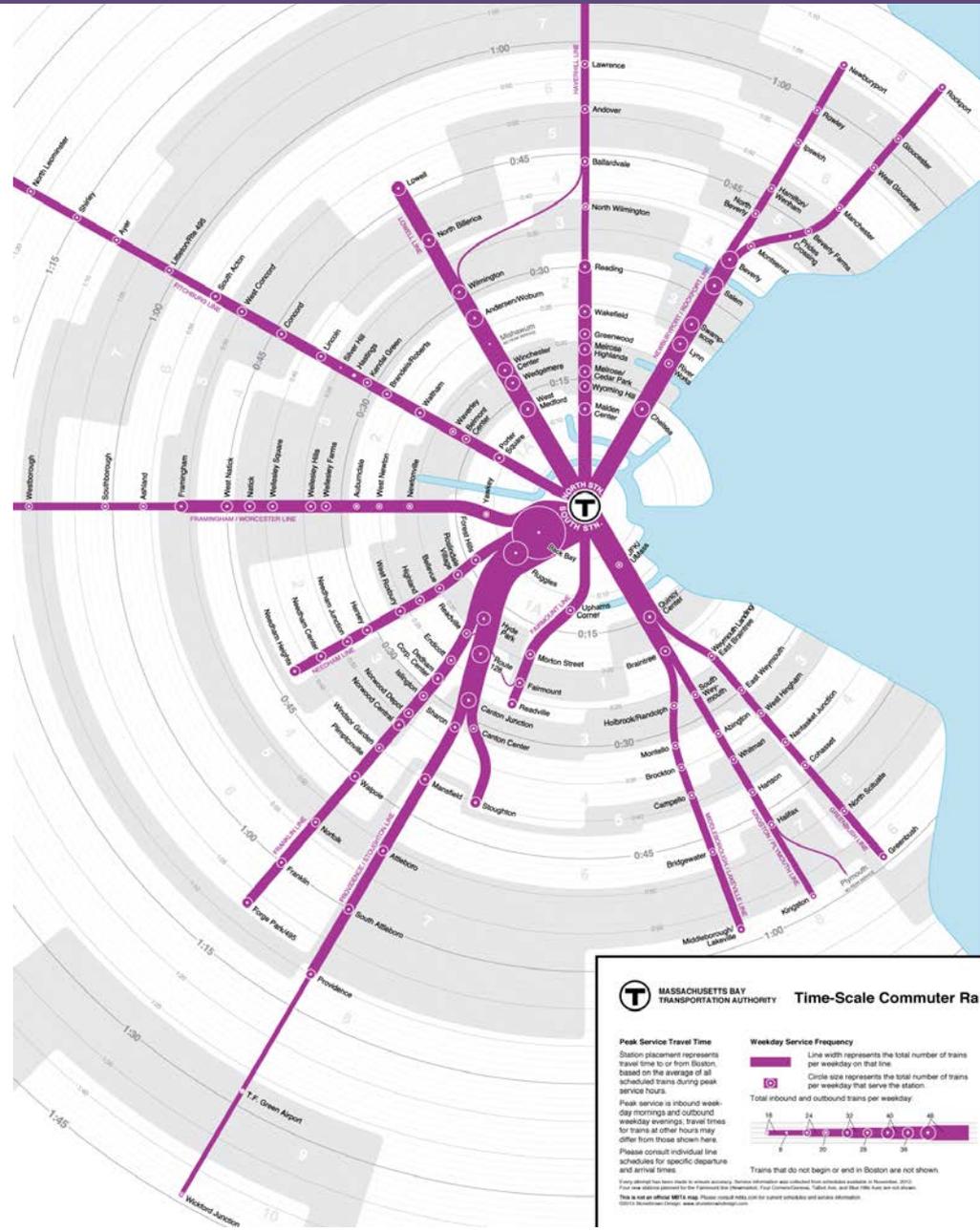
# SCOPE: MISSION & CONSTRAINTS

## Project Mission:

- Create Reliable and Resilient Commuter Rail Schedules
- Reduce Overcrowding on Trains and at Terminals
- Create Efficient and Logical Equipment Movements

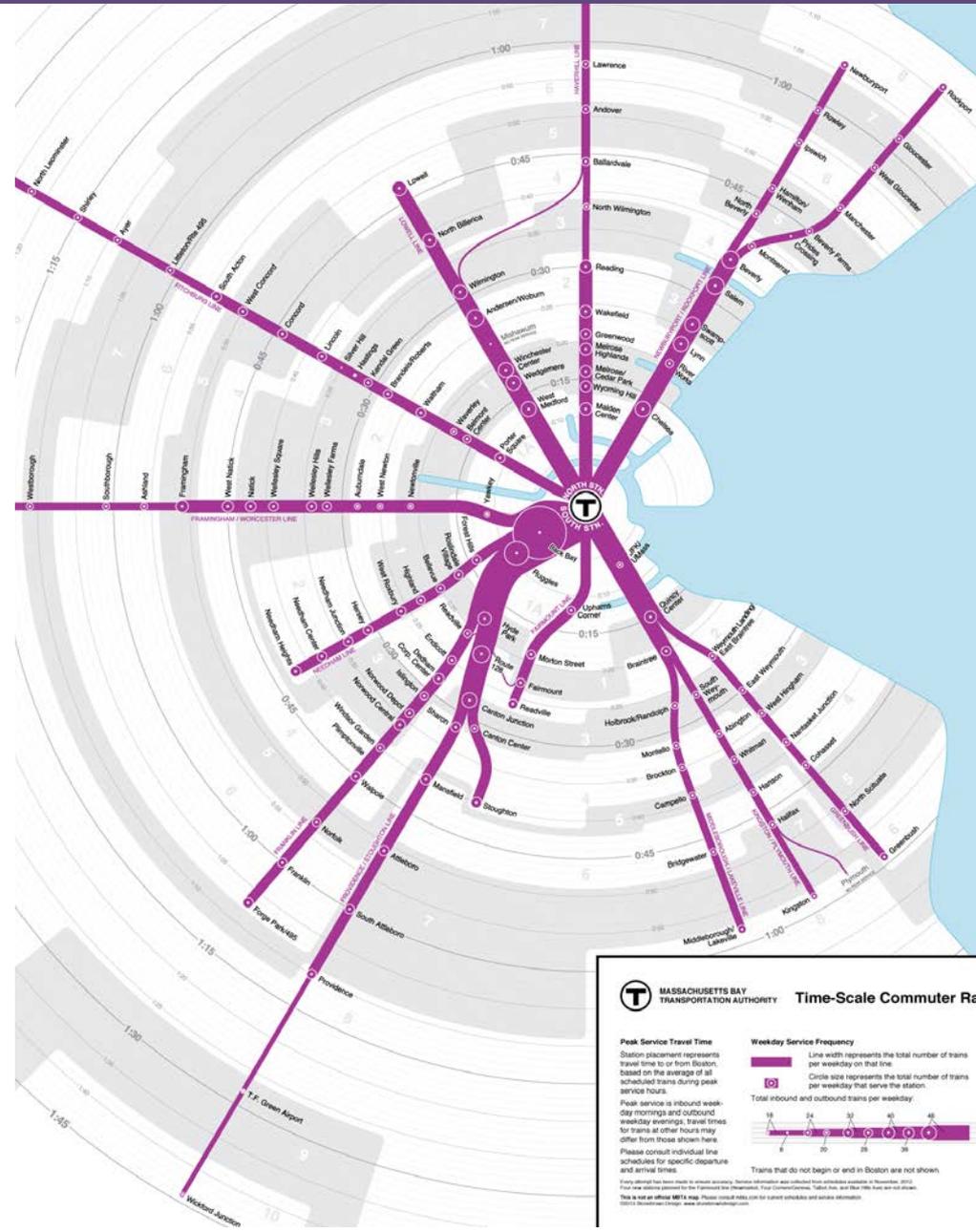
## Constraints:

- Existing Equipment
- Existing Track and Station Infrastructure Capacity
- Convenient Arrival/Departure Times at North and South Stations for Commuters
- Amtrak Services



# SCOPE: PROCESS

- Information and Data Collection
- Schedule Development
- Rail Traffic Controller Modeling
- Output Analyzed and Schedules Refined
- Draft Final Schedules for Public Comments
- Final Schedules Based on Public Comments



# SCOPE: LINES

- Northside Lines

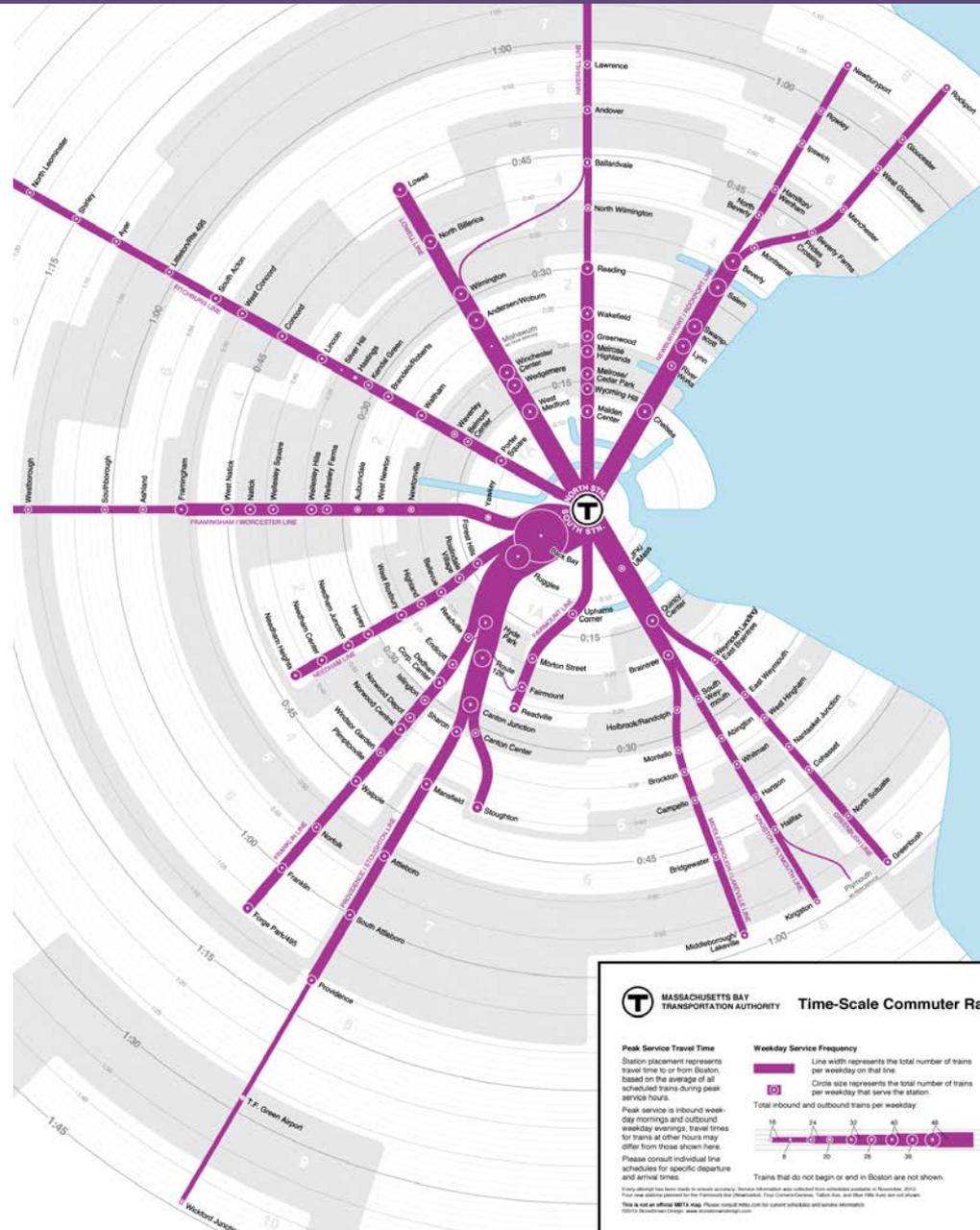
- Fitchburg
- Lowell
- Haverhill
- Newburyport/Rockport

- Southside Lines

- Worcester
- Needham
- Providence/Stoughton
- Franklin
- Fairmount

- Old Colony Schedules will not Change

- Middleboro
- Kingston/Plymouth
- Greenbush



# EXISTING CONDITIONS

- **Schedules with Legacy Inconsistencies, Including:**
  - Uneven Service Levels and Headways
  - Irregular Express and Local Train Patterns
  - Ridership Exceeding Trainset Capacity
- **Equipment Movements:**
  - Short Turntimes at Terminals Impairs Schedule Resiliency
  - Interlined Sets Cause Cascading System-Wide Delays
- **Old Colony Line Schedules**
  - Developed for Railroad Operations and Equipment Performance Characteristics
  - The Schedules have the Highest On-Time Performance in the MBTA Commuter Rail System

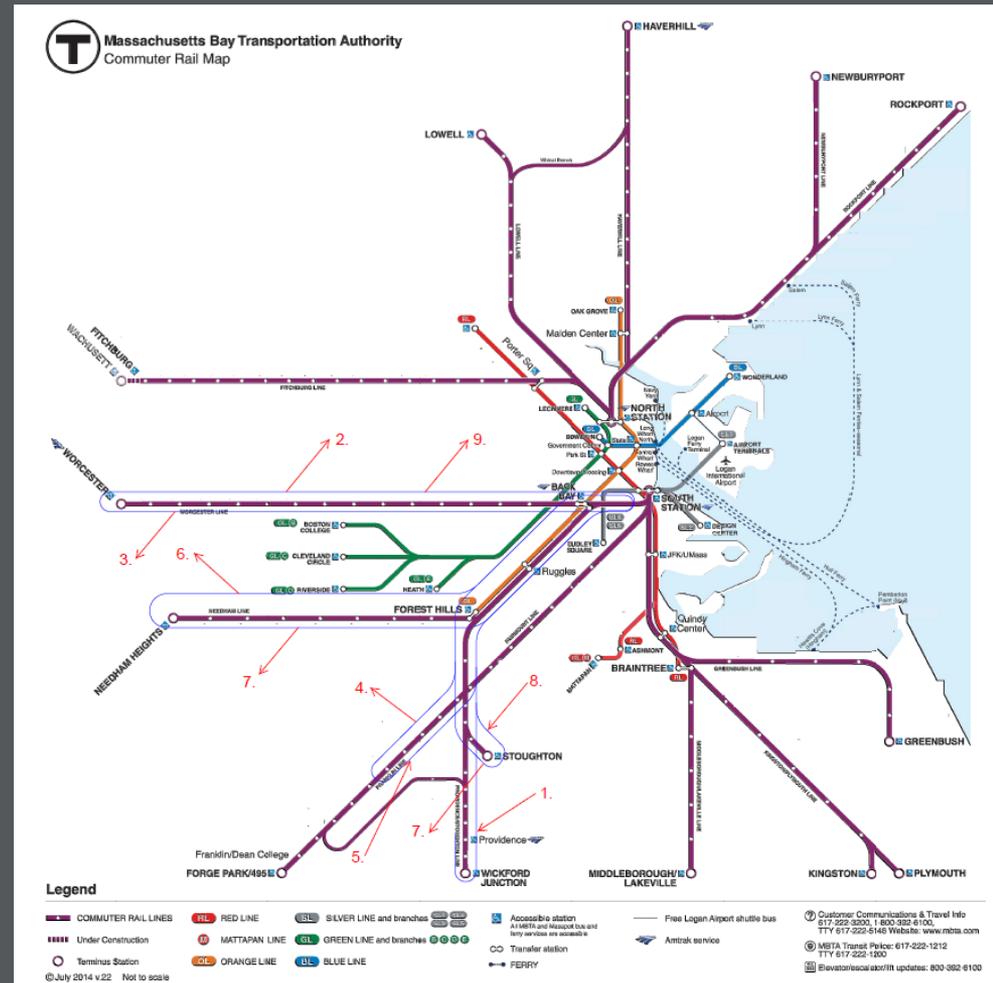
15AM	Washington, DC	2159	TBD
20AM	Readville	753	TBD
25AM	Greenbush	073	TBD
25AM	Forge Park/495	707	TBD
30AM	Richmond, VA-St	93	TBD
45AM	Stoughton	911	TBD
55AM	Providence	805	TBD
57AM	Middleboro/Lake	007	TBD
	Amherst Heights	611	TBD



# EXISTING CONDITIONS

## Interlined Sets

- Interlined Sets can cause significant cascading delays across the MBTA Commuter Rail network.
- For example, on a typical day, Set B makes the following trips:
  - Providence to Boston
  - Boston to Worcester Roundtrip
  - Boston to Norwood Central Roundtrip
  - Boston to Needham Roundtrip
  - Boston to Stoughton Roundtrip
  - Boston to Worcester
  - **Worcester to Providence (via Boston) Deadhead**
- If Set B is delayed due to an issue on the Worcester Line, then subsequent lines are potentially delayed too.



# NEW SCHEDULE DEVELOPMENT: SYSTEM-WIDE

## Assumptions:

- Near-Term Infrastructure Improvements:
  - Fitchburg Line Track Improvements and New Station and Layover Facility at Wachusett
  - Worcester Line Track De-Stressing and Boston Landing Station
- Equipment Constraints
  - 25 Northside and 39 Southside Trainsets Available
  - Mechanical Performance Metrics (Speed, Horsepower, Tractive Effort)
- Terminal and Maintenance Yard Operations and Capacity
- Amtrak Schedules



# BENEFITS: OPERATIONS

- Preventing Cascading Delays by Reducing Interlined Trains
- Creating Standardized Minimum 15-Minute Turntimes and Reduction of Scheduled Long-Dwells at North and South Stations
- Optimization of Corridor Capacity through Rail Traffic Controller (RTC) Analysis
- Provide Adequate Maintenance and Processing Time at Maintenance Yards
- New Infrastructure Modeled



# BENEFITS: PASSENGER EXPERIENCE

- Overall Increased Peak Train Service
- Additional Peak Express Service from Outer Points and Complementary Peak Service from Inner Stations
- Reduction in Train Crowding and Delays
- Optimized Peak Arrival and Departures from Boston for Key Job Start and End Times
- Standardized Peak "Box"
  - AM Peak Boston Arrival: 6:00 -10:00
  - PM Peak Boston Departure: 3:30 - 7:00
- Consistent Off-Peak Departure Times





BOARD YOUR

TRAIN HERE

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## **Northside Schedule Summary**

# NORTHSIDE SUMMARY: EXISTING SERVICE

## Most Served Stations

Station	Weekday Service
Beverly	61
Salem	61
Anderson/ Woburn	57
Chelsea	51
Swampscott	50
Lynn	50

## Least Served Stations

Station	Weekday Service
Waverley	21
N. Wilmington	22
West Gloucester	25
Beverly Farms	25
Montserrat	25
Ipswich	25
Rowley	25

Existing Average Stops Per Northside Station: 34.5

Excludes North Station and Special Stations (Silver Hill, Hastings, Prides Crossing, Riverworks, and Mishawum)



# NORTHSIDE SUMMARY: PROPOSED SERVICE

## Most Served Stations

Station	Weekday Service
Beverly	67
Salem	67
Chelsea	56
Swampscott	55
Lynn	55

## Least Served Stations

Station	Weekday Service
N. Wilmington	23
Waverley	26
Rockport to Montserrat	30
Haverhill to Ballardvale	30

Proposed Average Stops Per Northside Station : 37.5

Excludes North Station and Special Stations (Silver Hill, Hastings, Prides Crossing, Riverworks)



# FITCHBURG LINE

## Peak Service

- Similar Local and Express Service between Boston and Fitchburg as in Current Schedules
- One Additional PM Peak Local Roundtrip between Boston and Fitchburg
- AM and PM Reverse Commute Options to Accommodate Job Start/End Times at Waltham, Brandeis/Roberts, Littleton/495, and Fitchburg

## Off Peak & Weekend Services

- All-Stop Service Levels Boston to Fitchburg Similar to Current Schedules

## Travel Times

- **Improved Travel Times** due to Fitchburg Line Track Work Completion. For example:
  - Current Fitchburg to Boston Express: 1:20
  - Future Fitchburg to Boston Express: 1:10
- Time for **Wachusett Station and Layover Facility** Factored into Schedules



# LOWELL LINE

## Peak Service

- Similar Local and Express Service between Boston and Lowell as in Current Schedules
- One Additional AM and PM Peak Local Roundtrip Train
- AM and PM Reverse Commute Options to Accommodate Job Start/End Times at Anderson/Woburn and Lowell

## Off Peak & Weekend Services

- All-Stop Service Boston to Lowell with Similar Service Levels as Current Schedules

## Travel Times

- Overall, Travel Times are Similar to Existing Services



# HAVERHILL LINE

## Peak Service

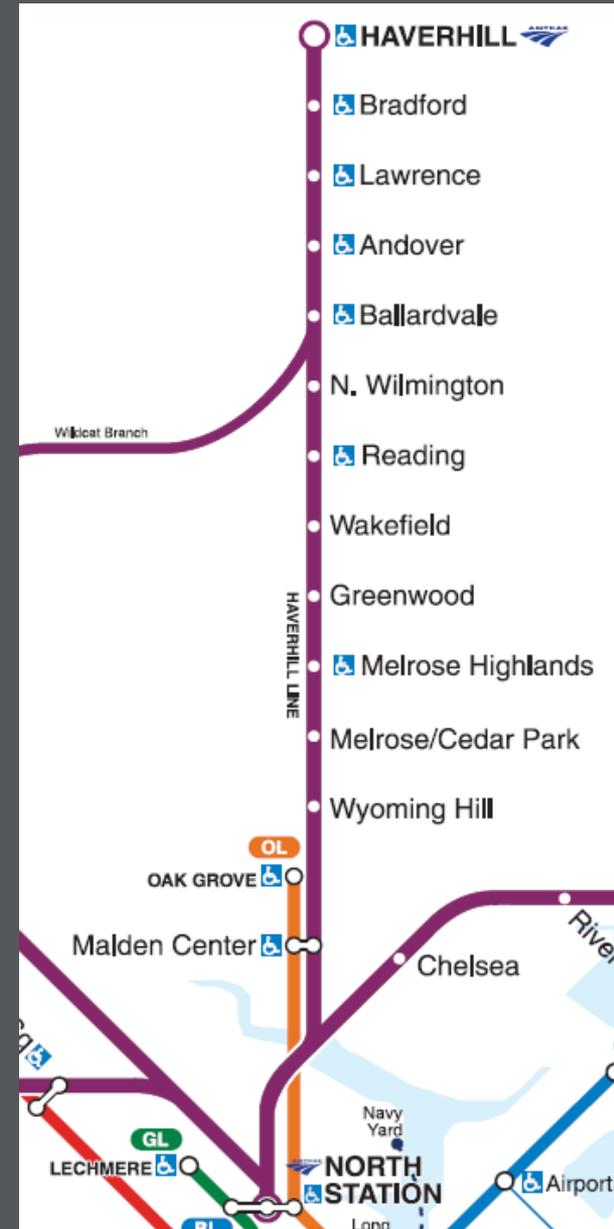
- Similar Local and Express Service between Boston and Haverhill as in Current Schedules
- Additional PM Peak Express Train Operating between Boston and Haverhill via the Lowell Line
- Utilization of Bus Bridge between Bradford and Haverhill to Account for Merrimack River Bridge Work, Similar to Current Schedules

## Off Peak & Weekend Services

- All-Stop Service Boston to Haverhill via Reading with Similar Frequencies as Existing Schedules

## Travel Times

- Overall, Travel Times are Similar to Existing Services
- Improved Travel Times for Ballardvale to Haverhill Commuters due to Additional PM Express Option.



# NEWBURYPORT/ROCKPORT LINES

## Peak Service

- Two New AM and One PM Express Trains between Boston and Newburyport (None in Current Schedules)
- Two AM and PM Rockport Express Trains
- Similar Local Service between Newburyport/Rockport Stops and Boston
- Improved Local and Express Train Coordination Allowing for Less Crowded Peak Trains

## Off Peak & Weekend Services

- All-Stop Service Boston to Forge Park with Similar Frequencies as Existing Schedules

## Travel Times

- Overall, Travel Times are Similar to Existing Services
- Improved Travel Times for Newburyport Commuters with New Express Options





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## Southside Schedule Summary

# SOUTHSIDE SUMMARY: EXISTING SERVICE

## Most Served Stations

Station	Weekday Service
Readville	70
Route 128	55
Canton Junction	49
Framingham	48
West Natick	43
Hyde Park	43

## Least Served Stations

Station	Weekday Service
Wickford Junction	20
T.F. Green	20
Canton Center	25
West Newton	26
Newtonville	26

Existing Average Stops Per Southside Station: 34.5

Excludes Core Stations (South Station, Back Bay, Ruggles), Special Stations (Foxboro, Plimptonville), and Old Colony Services



# SOUTHSIDE SUMMARY: PROPOSED SERVICE

## Most Served Stations

Station	Weekday Service
Readville	70
Route 128	67
Framingham	54
Hyde Park	53
Canton Junction	51

## Least Served Stations

Station	Weekday Service
Wickford Junction	20
T.F. Green	20
Canton Center	26
West Newton	28
Newtonville	28
Auburndale	28

Proposed Average Stops Per Southside Station: 36.8

Excludes Core Stations (South Station, Back Bay, Ruggles), Special Stations (Foxboro, Plimptonville), and Old Colony Services



# WORCESTER LINE

## Peak Service

- Four AM and PM Peak Worcester Express Trains (Compared to Three in Current Schedules)
- Additional All-Stop Peak Service between Framingham and Boston
- Worcester to Boston Bullet Train Pilot Program Initiated – **Providing a 53 Minute Trip from Worcester to Boston's Yawkey Station** and Continuing to Back Bay and South Station
- AM and PM Reverse Commute Options to Accommodate Job Start/End Times in Framingham and Worcester

## Off Peak & Weekend Services

- All-Stop Service Boston to Worcester with Similar Frequencies as Existing Schedules
- Maintains 20 Round Trip Trains Per Day between Boston and Worcester

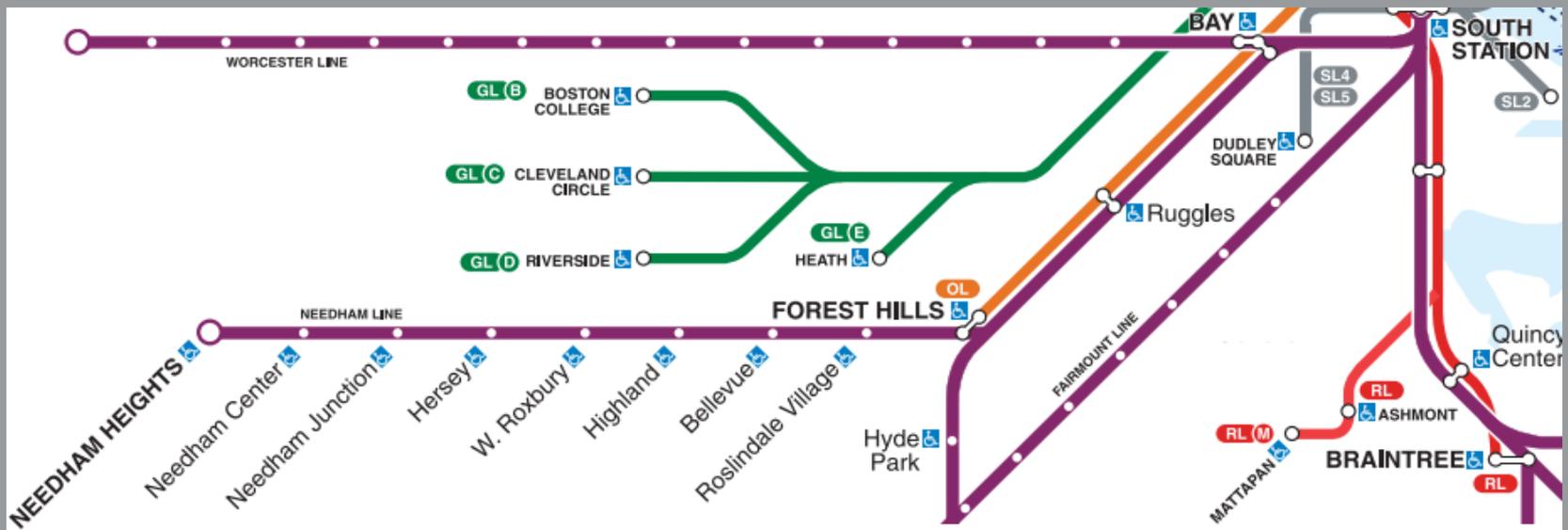
## Travel Times

- **Improved Travel Times** Due to De-Stressing Completion. For example:
  - Current Worcester to Boston Express: 1:22
  - Future Worcester to Boston Express: 1:12
- Time for **Boston Landing Station** Stop in Schedules



# NEEDHAM LINE

- **Peak Service**
  - Similar PM and AM Peak Service
  - Addition of New PM Express Departure from Boston to Needham
  - AM and PM Reverse Commute Options to Accommodate Academic Schedules in West Roxbury
- **Off Peak & Weekend Services**
  - All-Stop Service Boston to Needham with Similar Frequencies as Existing Schedules
- **Travel Times**
  - Similar Travel Times to Current Service for Local Service
  - Express PM Express Improves Travel Time for Commuters



# FRANKLIN LINE

## Peak Service

- Two AM and PM Express Trains between Boston and Forge Park (Current Schedules have One)
- Similar Local Service between Franklin Line Stops and Boston as Existing Schedules
- Improved Local and Express Train Coordination allowing for Less Crowded Peak Trains
- AM and PM Reverse Commute Options to Accommodate Key Job Start/End Times at Dedham Corporate Center

## Off Peak & Weekend Service

- All-Stop Service Boston to Forge Park with Similar Service Levels as Existing Schedules

## Travel Times

- Improved Travel Times for Commuters on Express Trains
- Similar Travel Times for Commuters on Local Trains



# FAIRMOUNT LINE

## Peak Service

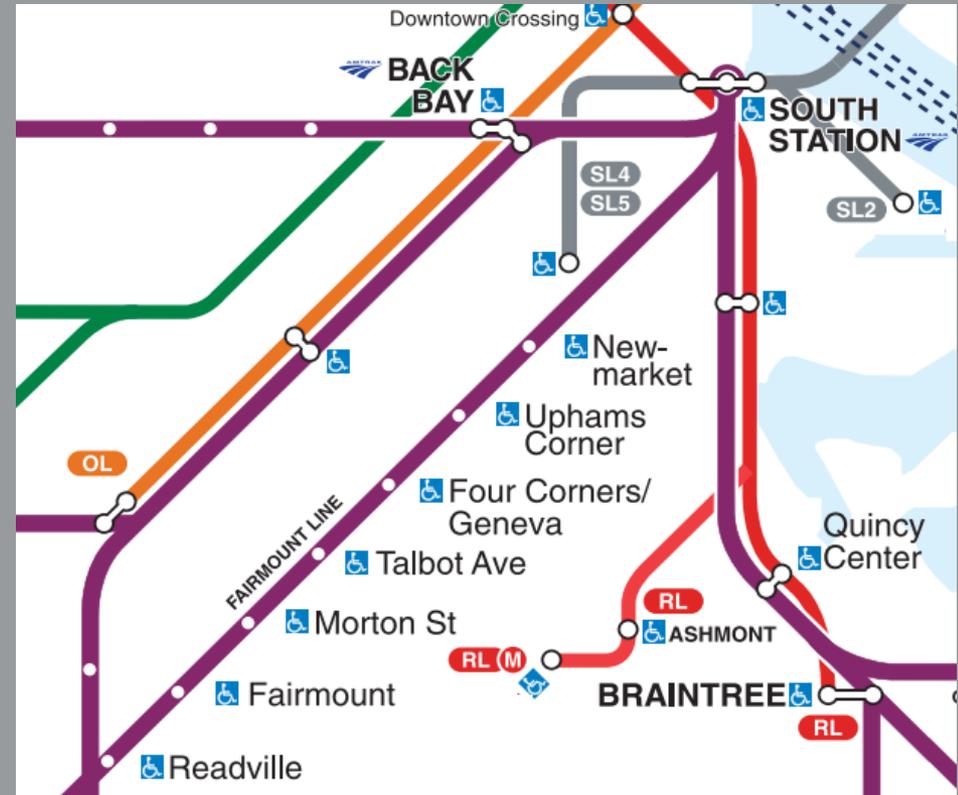
- Similar AM and PM Peak Service between Readville and South Station

## Off Peak Service & Weekend Service

- Off Peak Service between Readville and South Station Similar to Existing Schedules

## Travel Times

- Travel times account for positive stops at all stations. Current schedules have flag stops at many stations. This change improves service reliability by creating achievable travel times.



# PROVIDENCE/STOUGHTON LINES

## Peak Service

- Five AM Peak Express Trains between Providence & Boston (Current Schedules have Two)
- Six PM Peak Express Trains between Boston and Providence (Current Schedules have Two)
- Similar Local Service between Stoughton Stops and Boston
- Improved Local and Express Train Coordination Allowing for Less Crowded Peak Trains
- Improved Reverse Commute Options for Boston to Providence Travelers in AM and PM Peaks

## Wickford Junction & TF Green Services

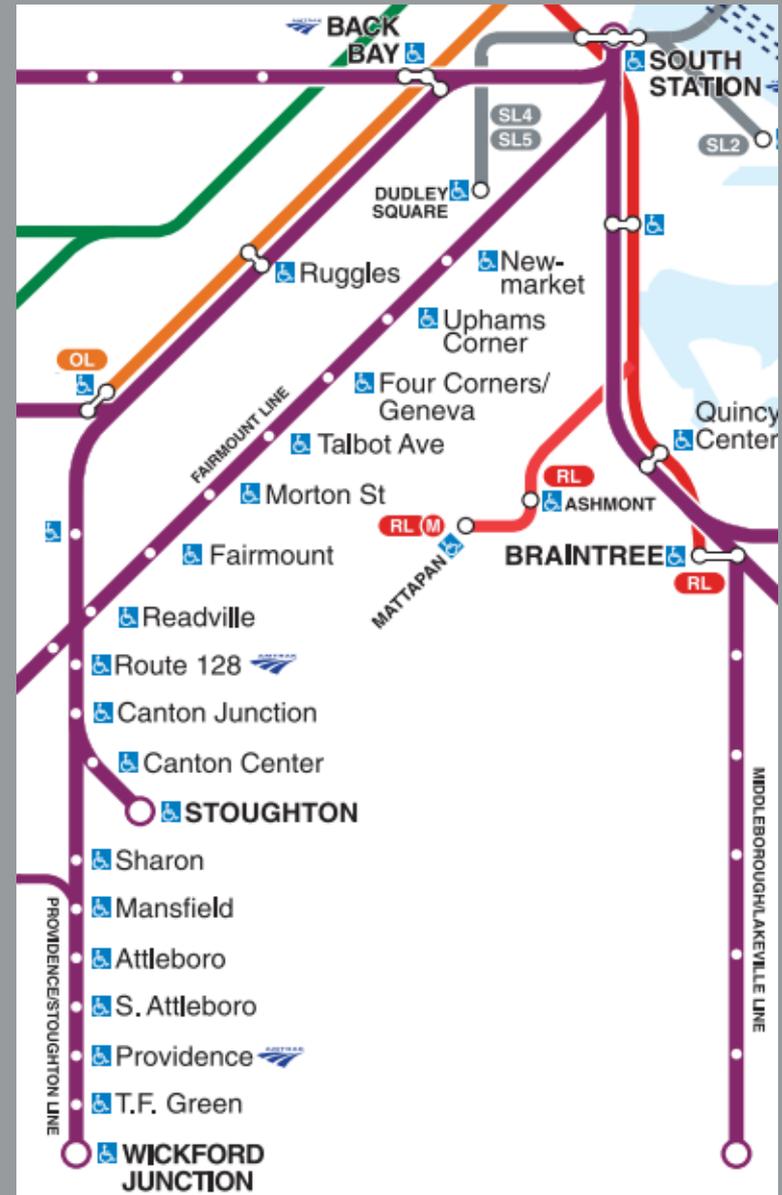
- Maintained 10 Roundtrips South of Providence
- Improved Service to Wickford Junction by Eliminating Transfers at Providence Station

## Off Peak & Weekend Service

- All-Stop Local Service Boston to Providence with Similar Service Levels as Existing Schedules

## Travel Times

- Improved Travel Times for Commuters on Express Trains
- Similar Travel Times for Commuters on Local Trains



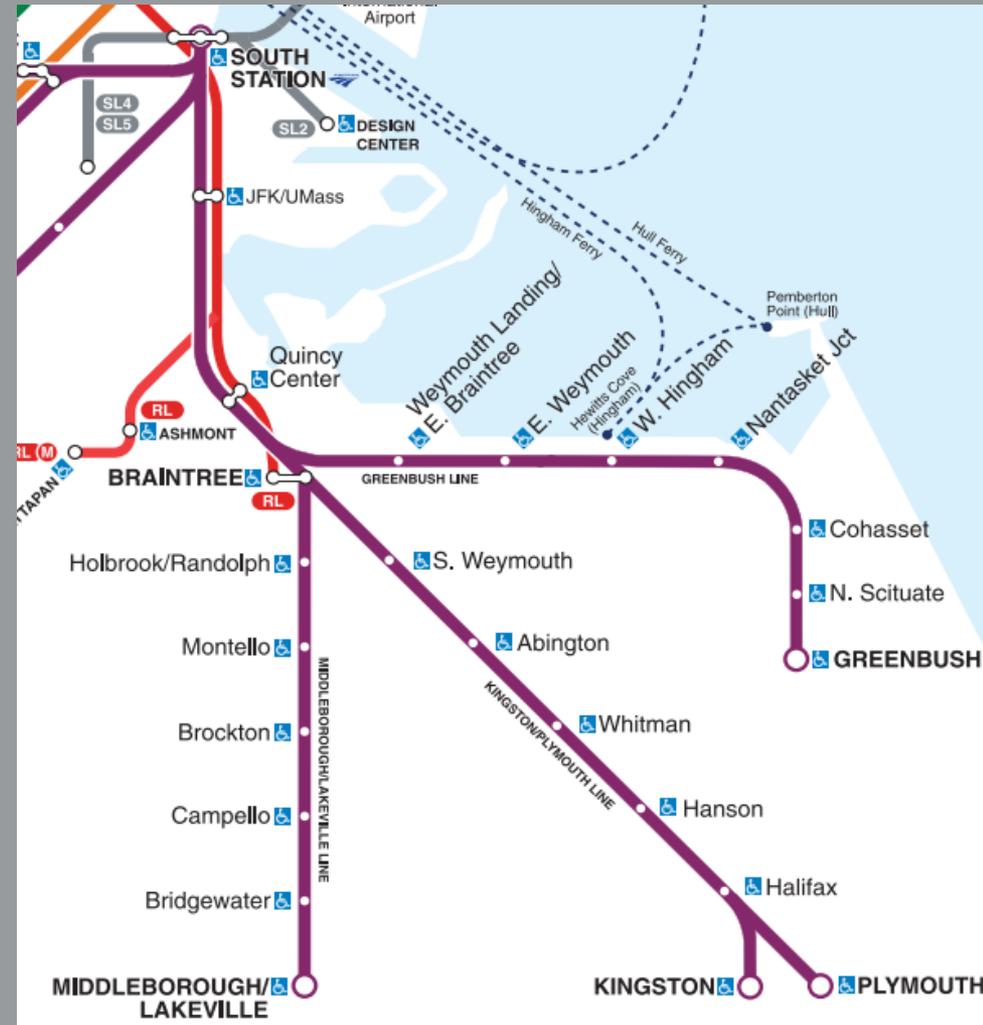
# OLD COLONY LINES

## No Service Changes

- Middleboro
- Kingston/Plymouth
- Greenbush

## Existing Services Typically Work

- Highest Average On Time Performance in Commuter Rail Network
- Crowding on Trains is Minimal
- System Developed based on Equipment and Operations in the 1990s without Legacy Constraints
- **Travel Times** for local services compare favorably with express services on other lines for similar distances. For example:
  - Middleboro – Boston = 36 Miles in 58 Minutes
  - Grafton – Boston = 37 Miles in 59 Minutes

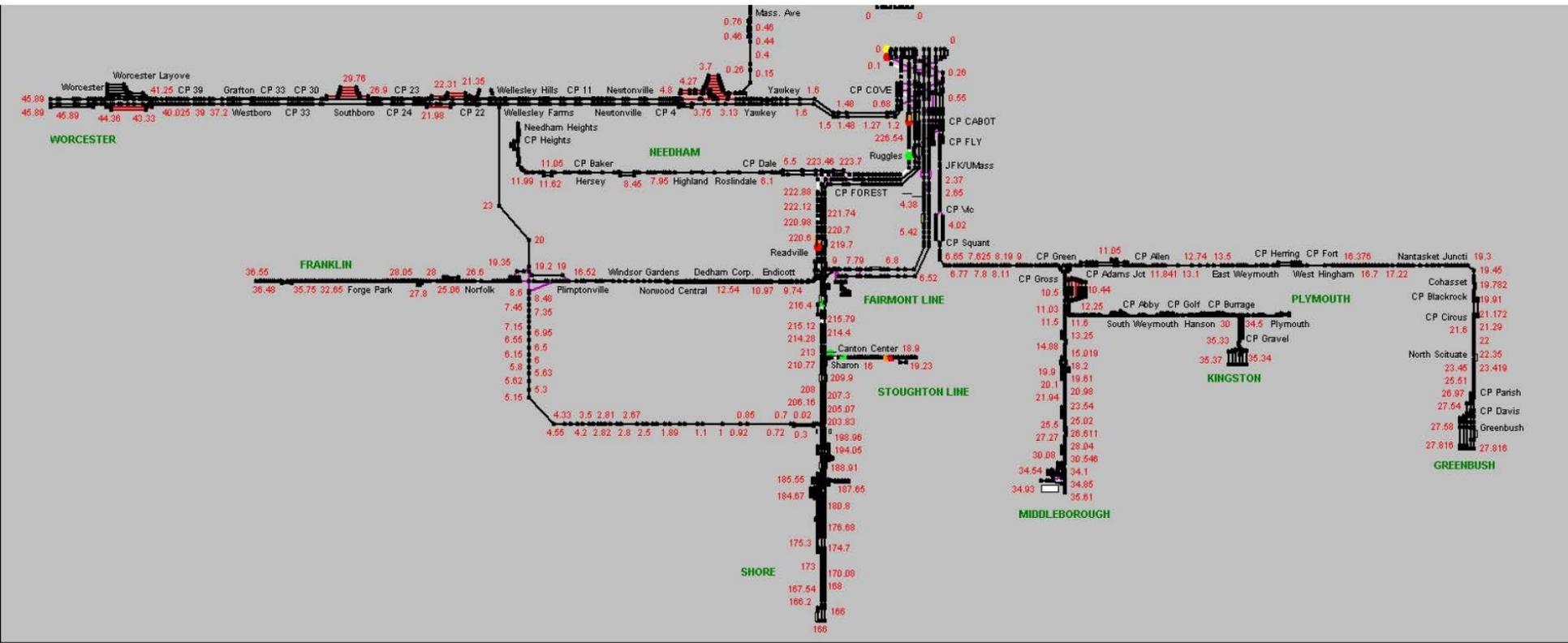




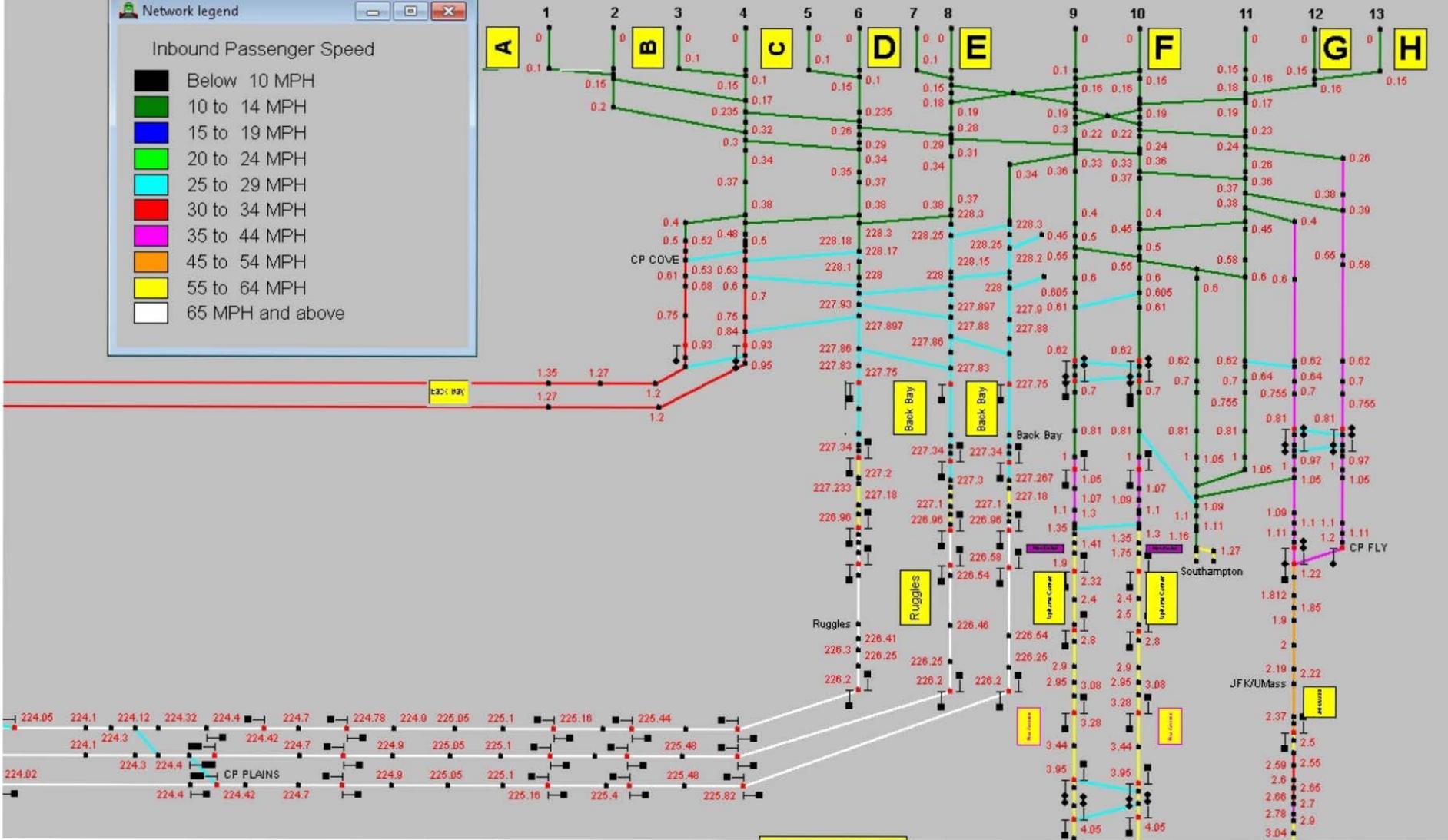
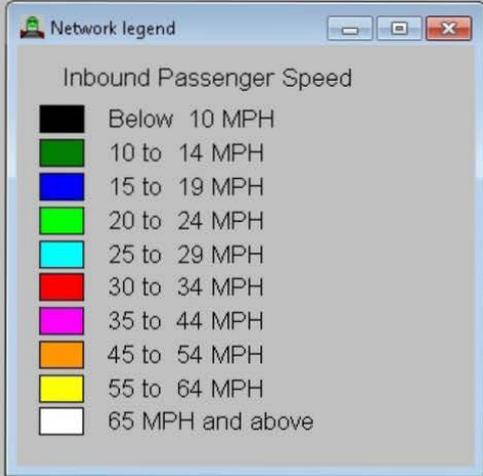
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# RTC Modeling

# RTC MODELING EXAMPLE: MBTA SOUTHSIDE



# RTC MODELING EXAMPLE: SOUTH STATION

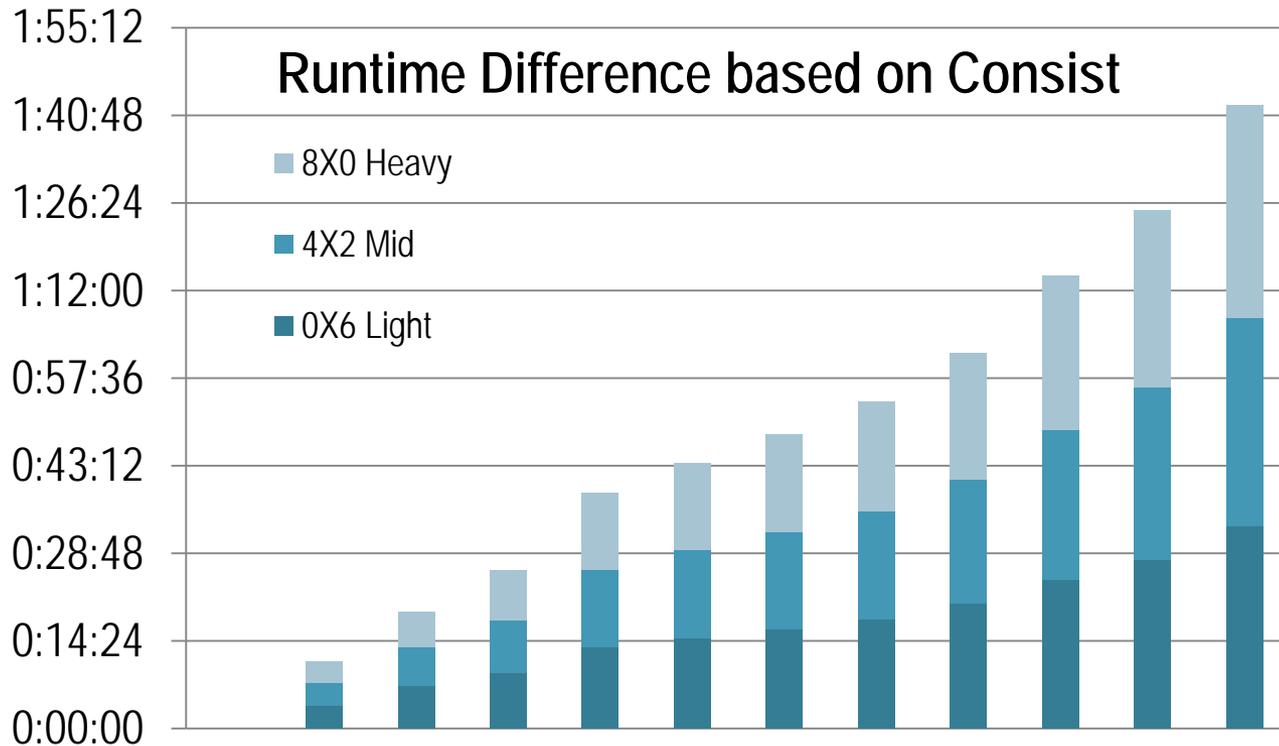


# RTC MODELING: PREFERRED TRAIN CONSISTS

- Locomotive – F40PH-2C
  - 3,000 HP with 2,610 HP for Tractive Effort (87%)
  - Full fuel tank
  - *Normal Engineer* (driving behavior)
- Train Consists
  - 10 types used on South Side
  - Pullman Flat (57 tons)
  - Kawasaki Bi-Level (65.5 tons)
  - Passenger Loading (180 lbs/person)
    - Light Ridership – 300 people
    - Medium – 600
    - Heavy – 900
    - Large – 1400

Approved Sets		
8/0	3	E,J,L
7/0	3	A,D,Q
5/0	2	AA,NN
4/2	10	C,H,I,K,M,R,S,T,W,Y
4/1	4	CC,DD,EE,II
3/2	4	BB,FF,GG,HH
2/4	1	P
2/3	4	JJ,KK,LL,MM
0/6	8	B,F,G,N,O,U,V,Z
0/5	1	X
	40	Sets

# RTC MODELING: TRANSIT TIMES



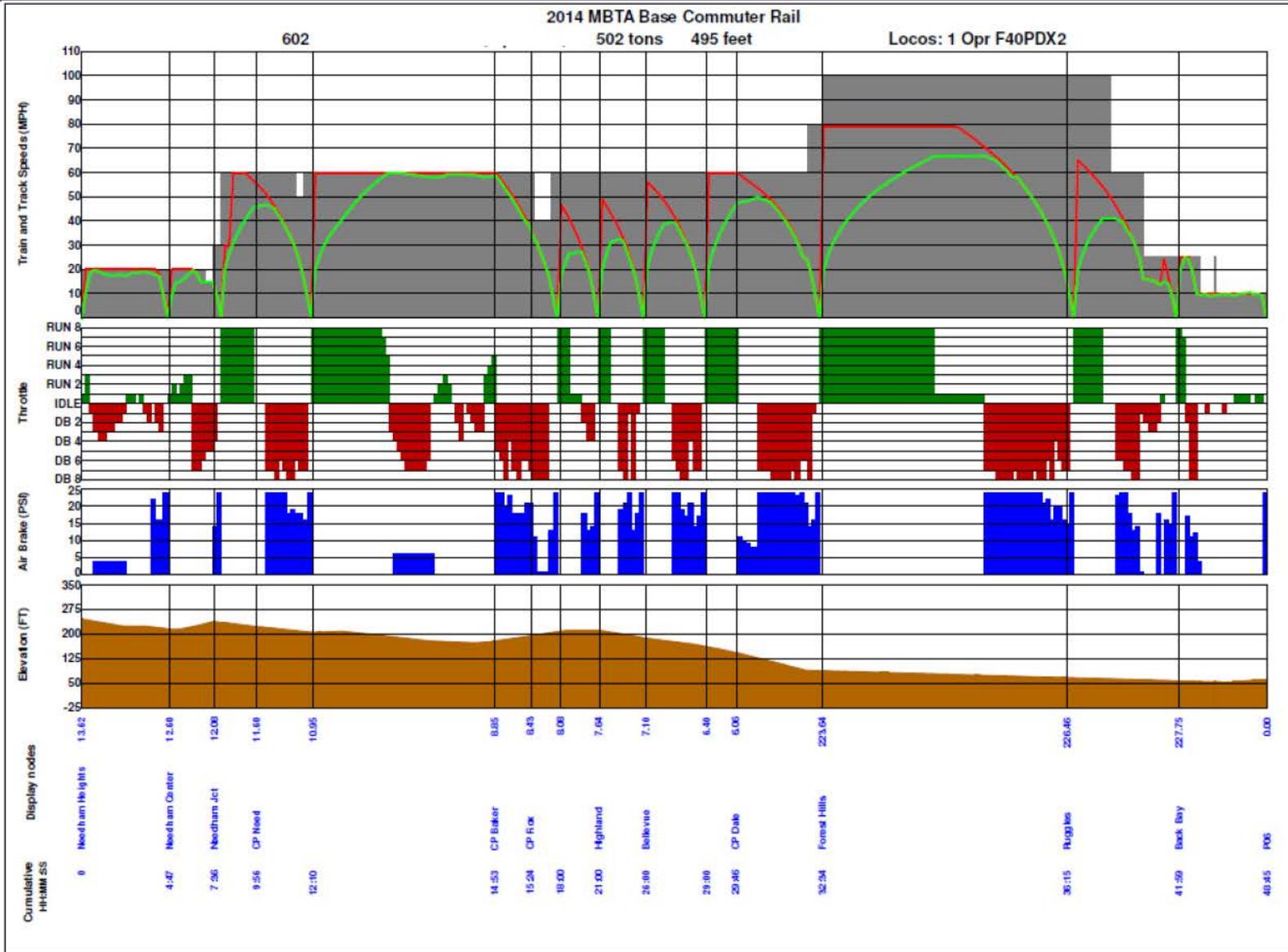
- Needham runtime difference of 3.5 minutes (8% total)

# RTC MODELING: LOCOMOTIVE CHARACTERISTICS

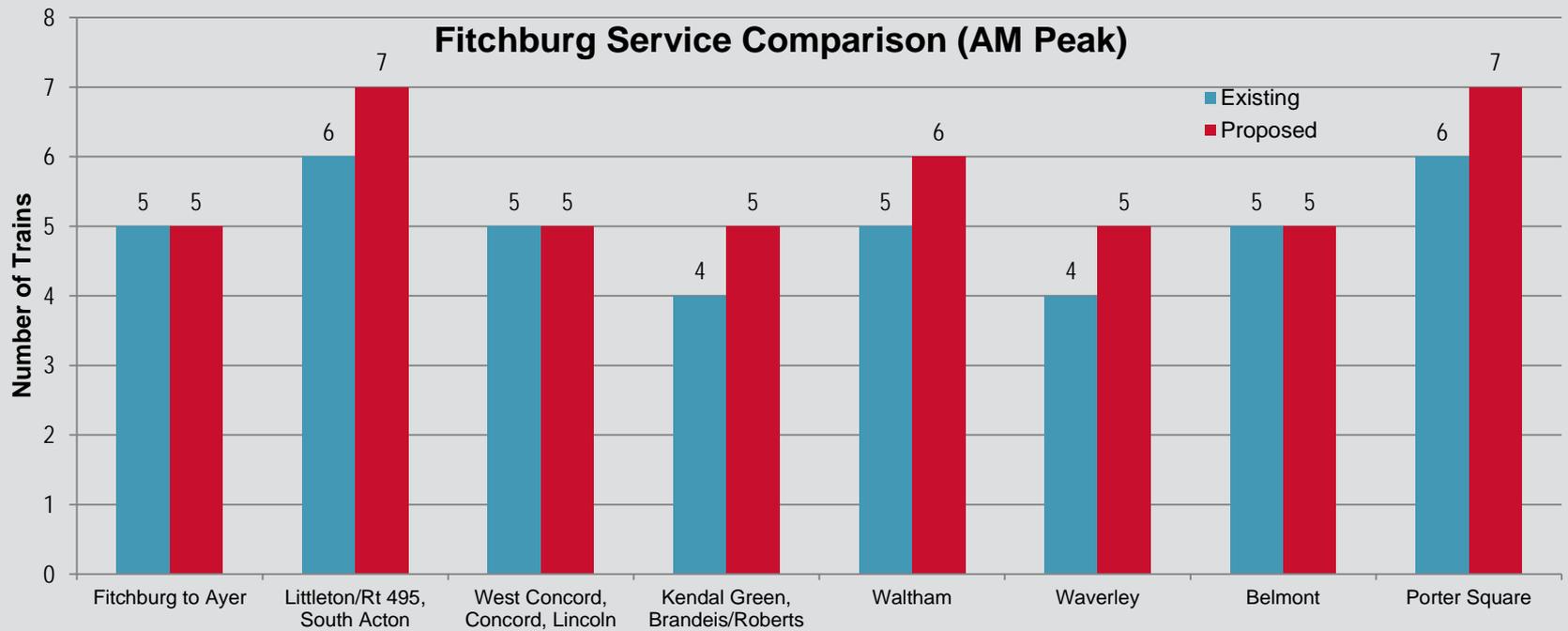
- Locomotive calibrated for MBTA based on field data collection and known locomotive attributes

Locomotive common name: F40PDX2	Comments: MBTA F40 tweaked by PDX
Locomotive Umler name: DASH8400	Verified data? Y
System of units for specification: ENGLISH	Power type: DIESEL
Number of axles: 4	ATC equipped? NO
Maximum speed: 100 MPH	Brake pipe pressure: 120.0 PSI
Minimum throttle buffer: 0 seconds	Full service application: 24.0 PSI
Maximum power at generator: 3000 HP	Emergency application: 35.0 PSI
Maximum power at rail: 2610 HP	
Maximum starting adhesion: 0.230	Number of seats: 2
Length: 69.000 FT	
Width: 11.700 FT	
Height: 15.500 FT	Cross sectional area: 181.350 Sq Ft
Minimum empty weight: 249200 LBS	
Maximum gross weight: 260000 LBS	Average tonnage: 127
Journal constant: 1.3000000	Locomotive Davis units: USA
Journal coefficient: 29.0000000	
Flange coefficient: 0.0300000	
Leading unit air coefficient: 0.0024000	
Trailing unit air coefficient: 0.0005000	

# RTC MODELING: RTC EXAMPLE OUTPUT

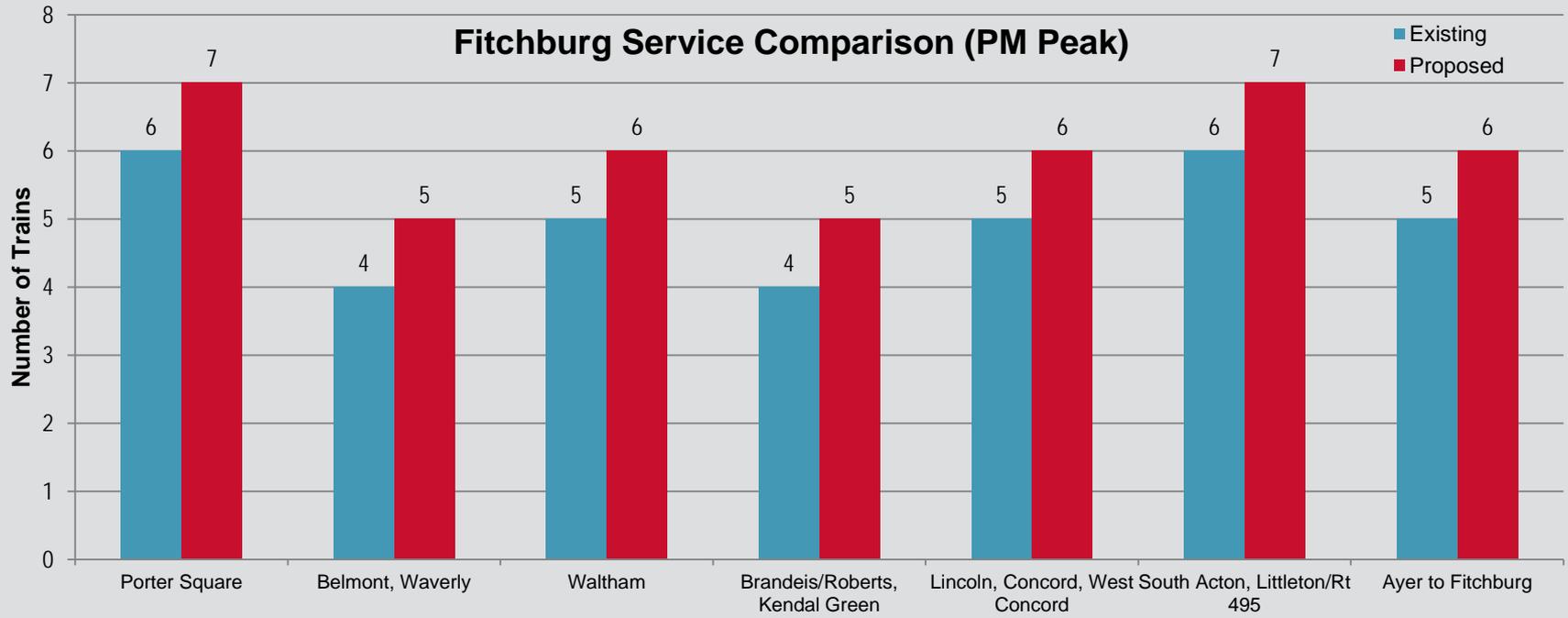


# FITCHBURG LINE



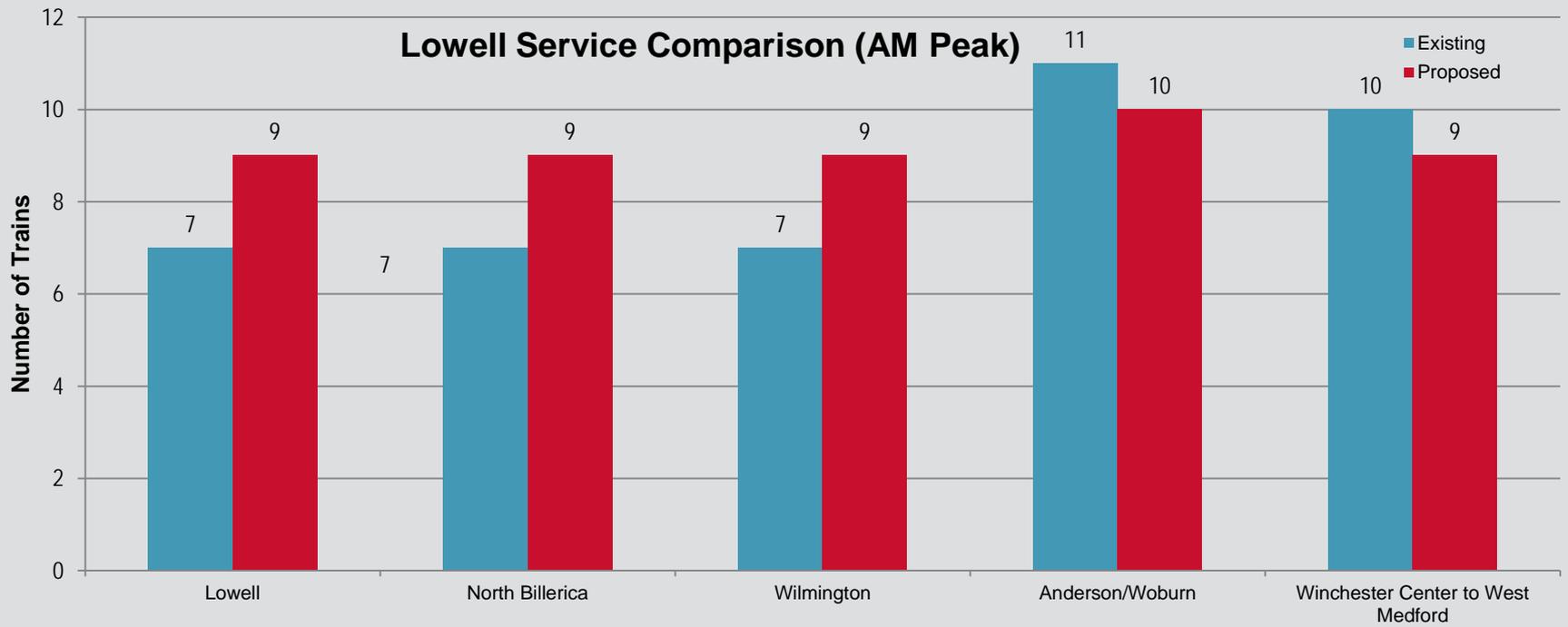
\*Maintained service to/from Silver Hill and Hastings

# FITCHBURG LINE



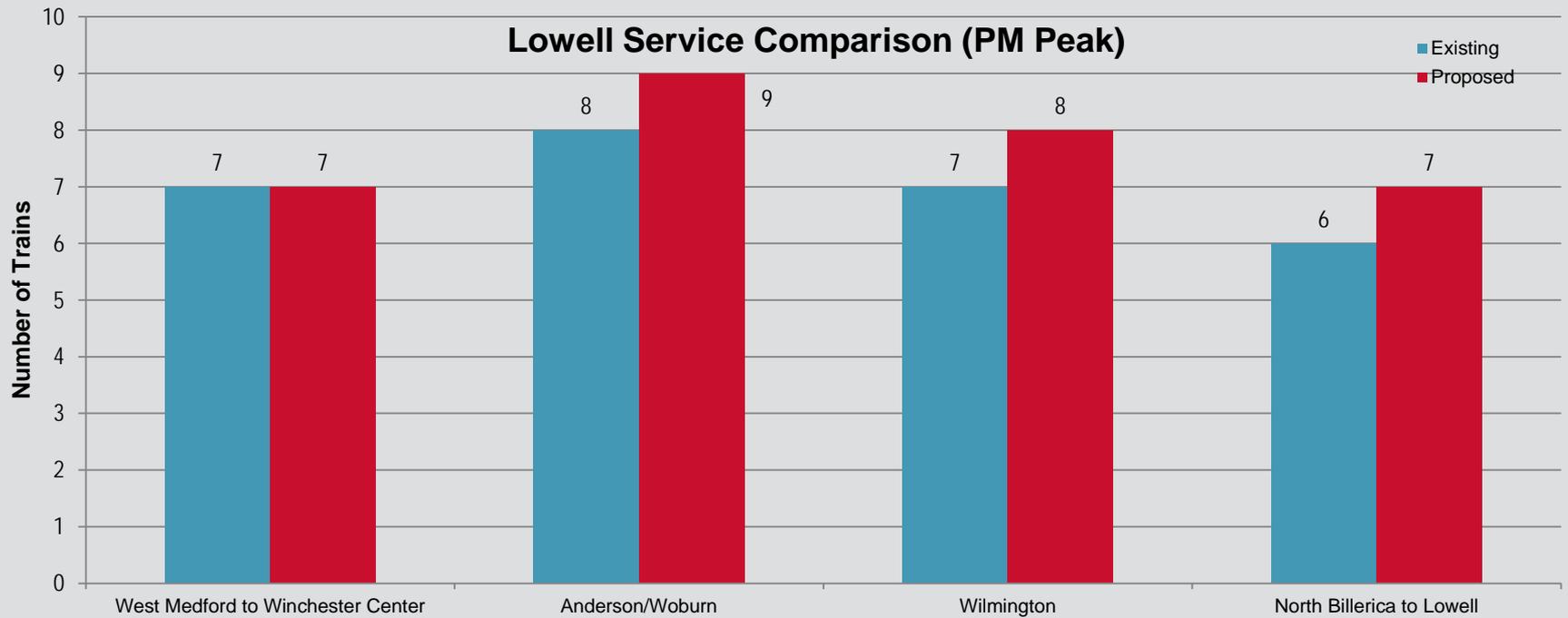
\*Maintained service to/from Silver Hill and Hastings

# LOWELL LINE



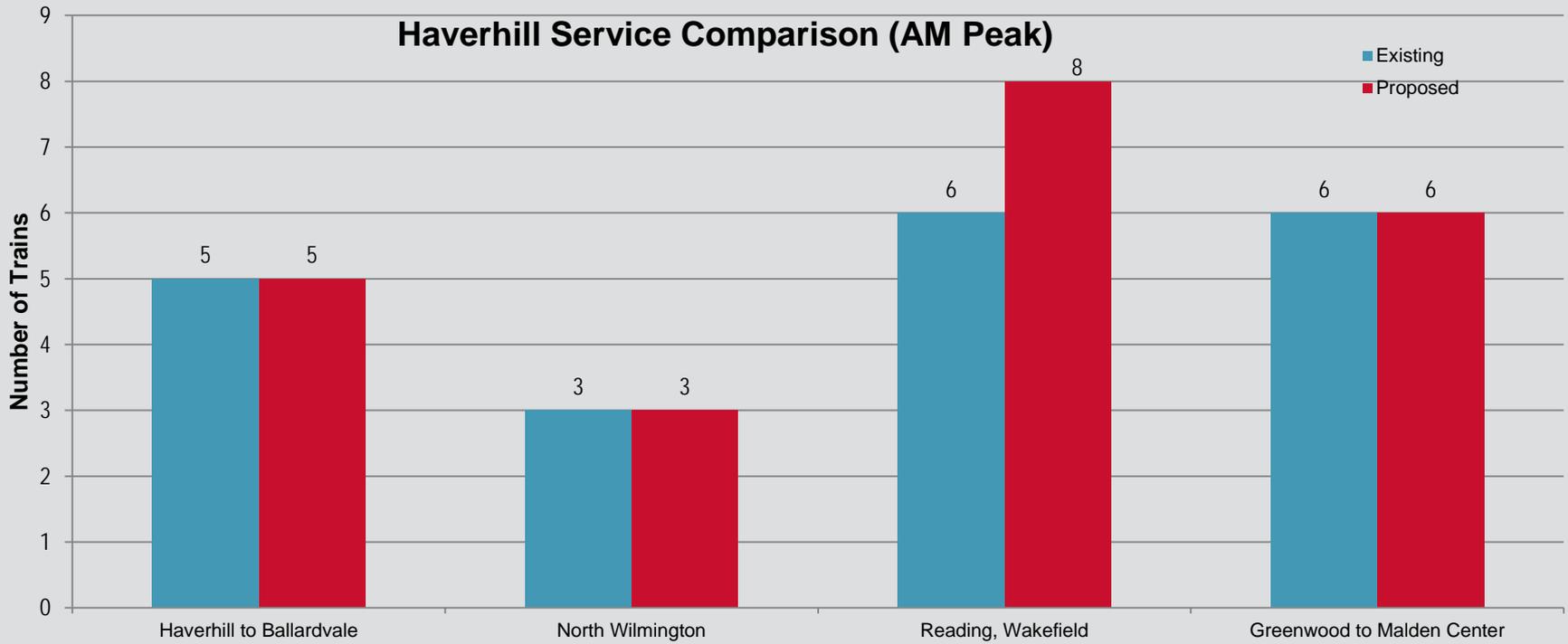
\*Maintained service to/from Mishawum

# LOWELL LINE

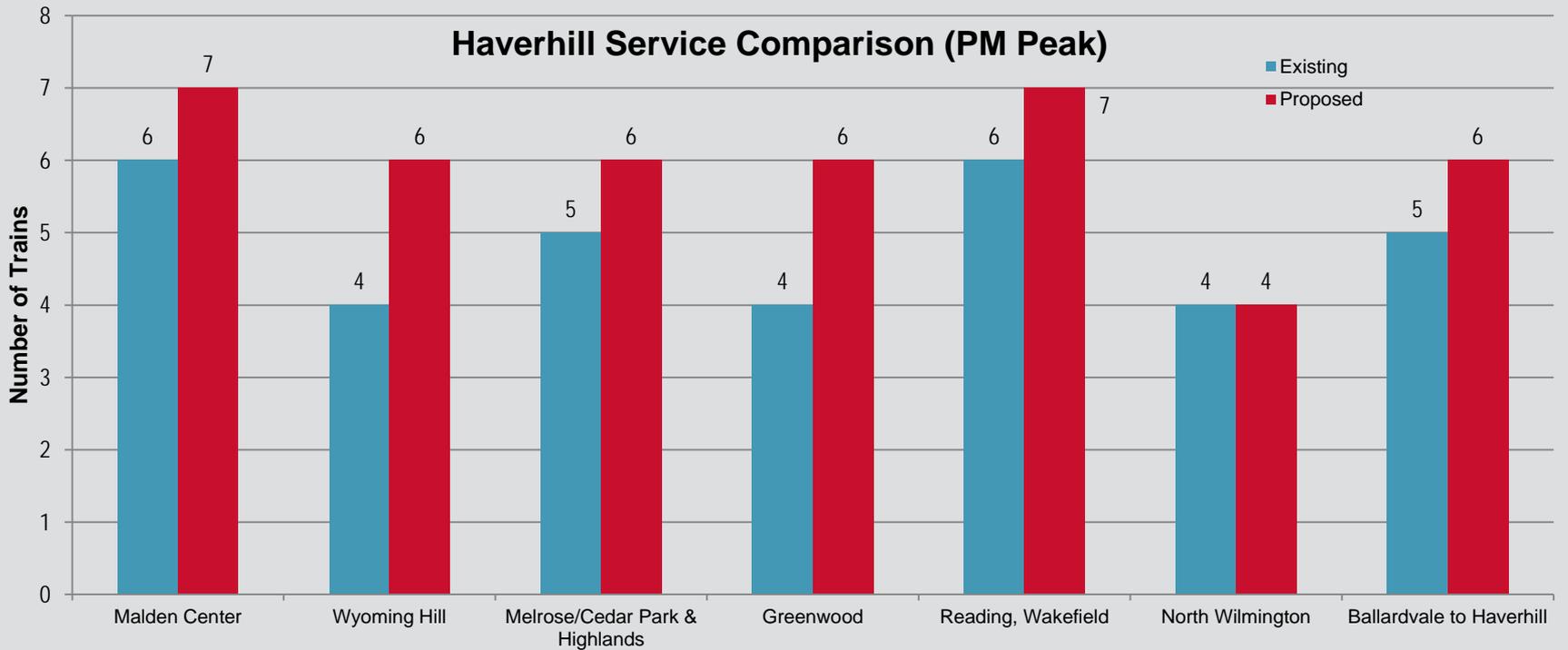


\*Maintained service to/from Mishawum

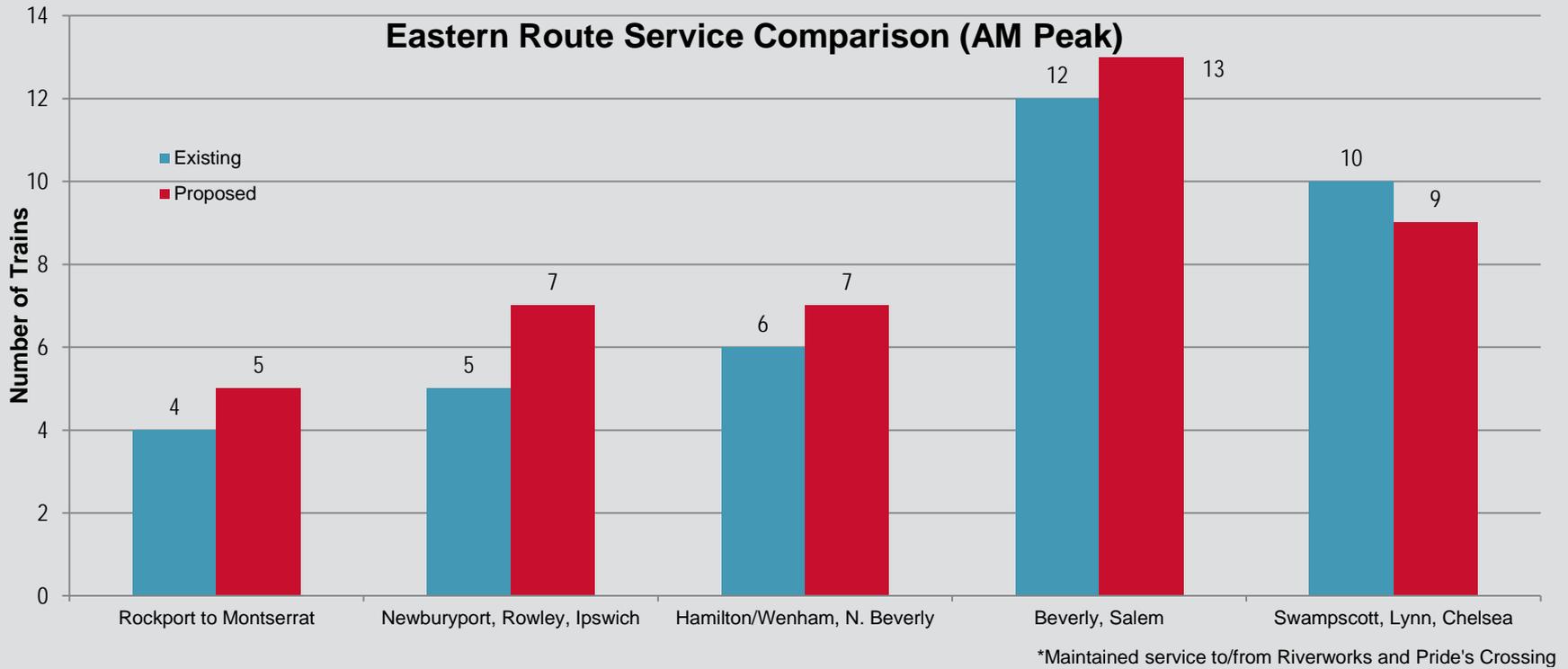
# HAVERHILL LINE



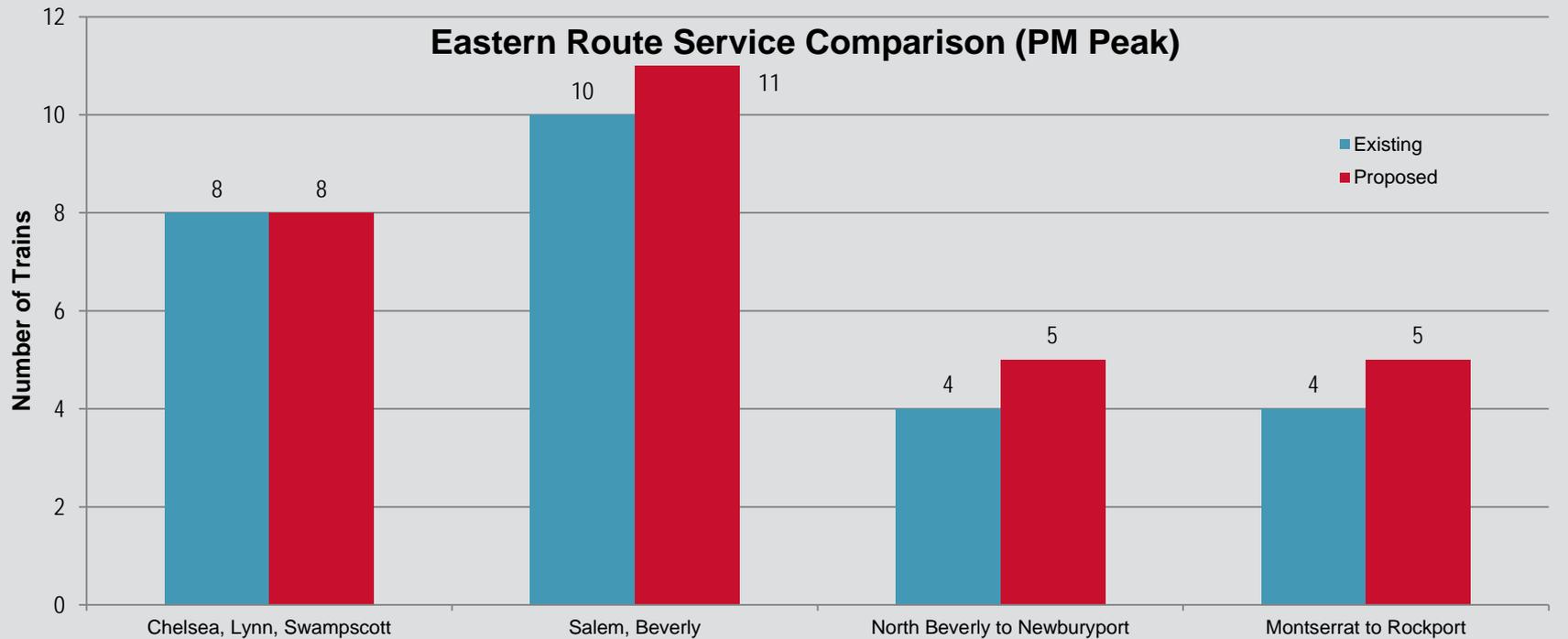
# HAVERHILL LINE



# NEWBURYPORT/ROCKPORT LINE

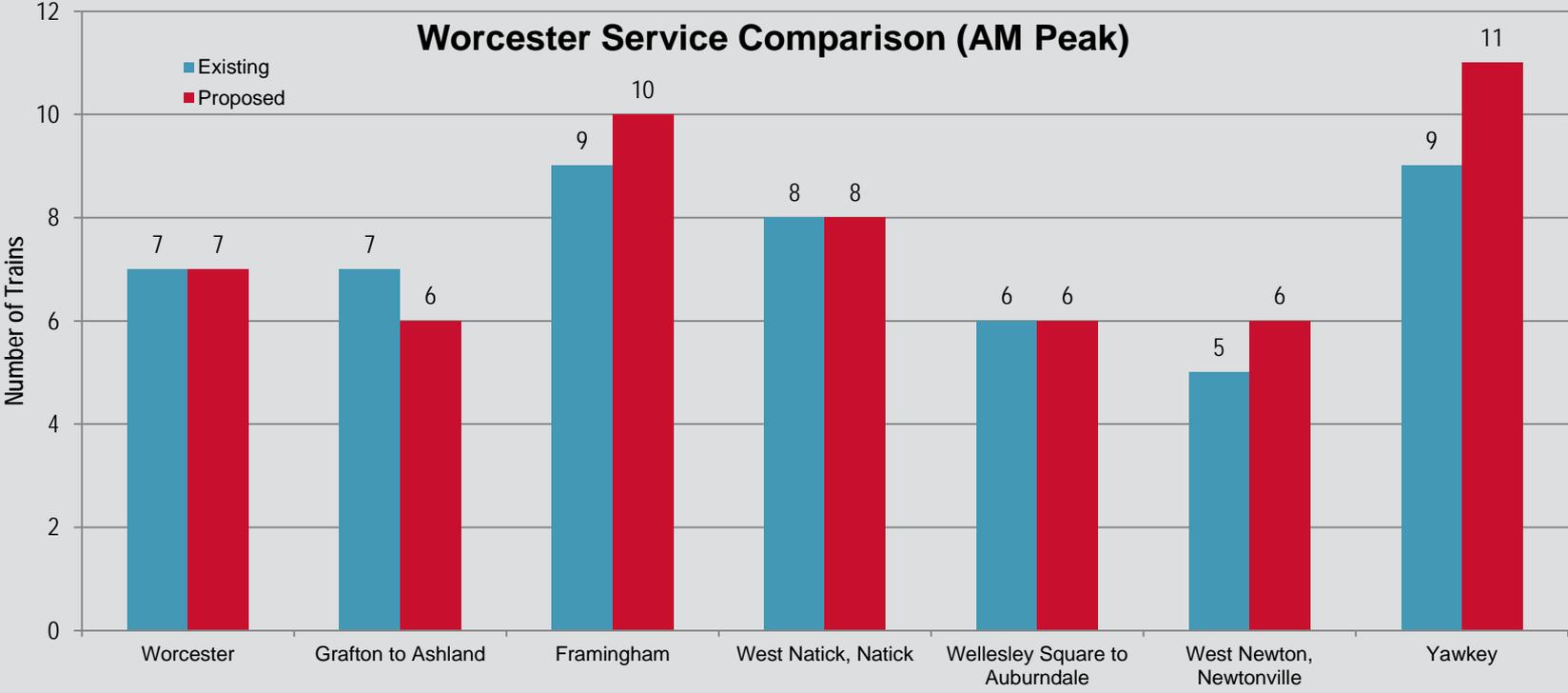


# NEWBURYPORT/ROCKPORT LINE

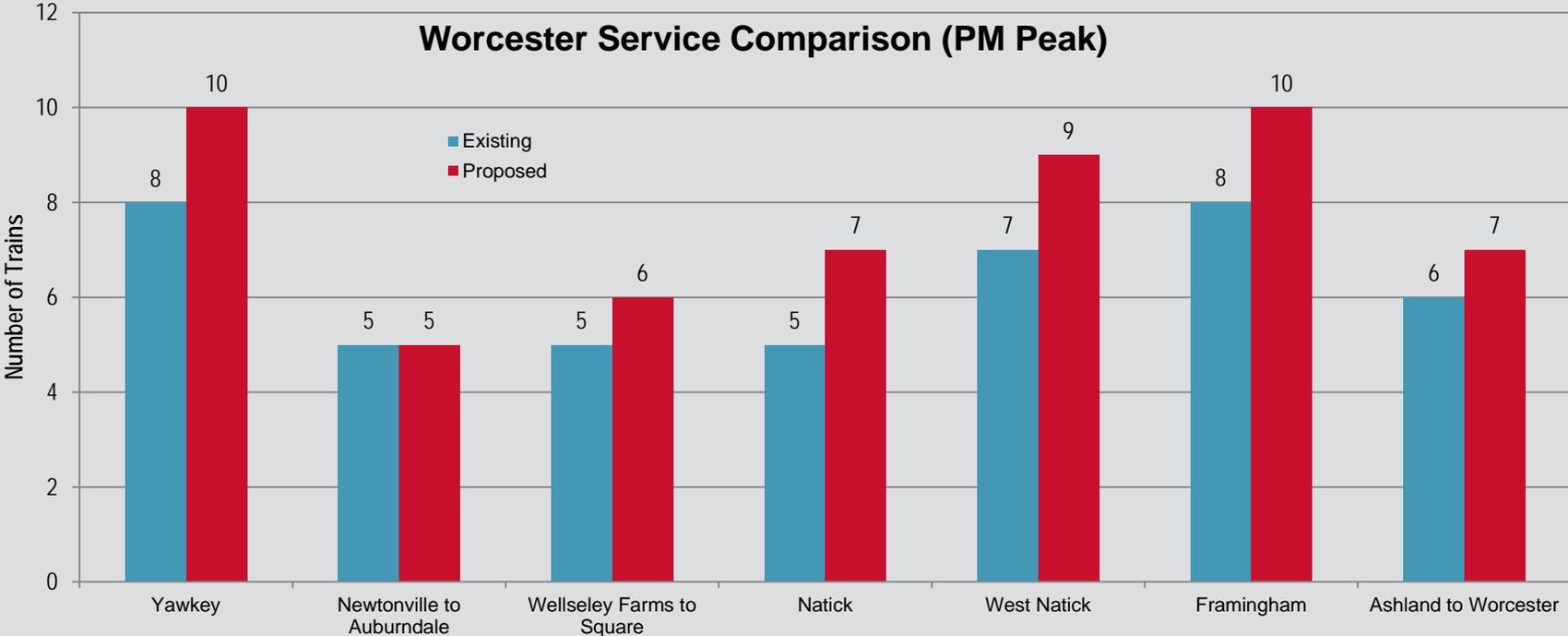


\*Maintained service to/from Riverworks and Pride's Crossing

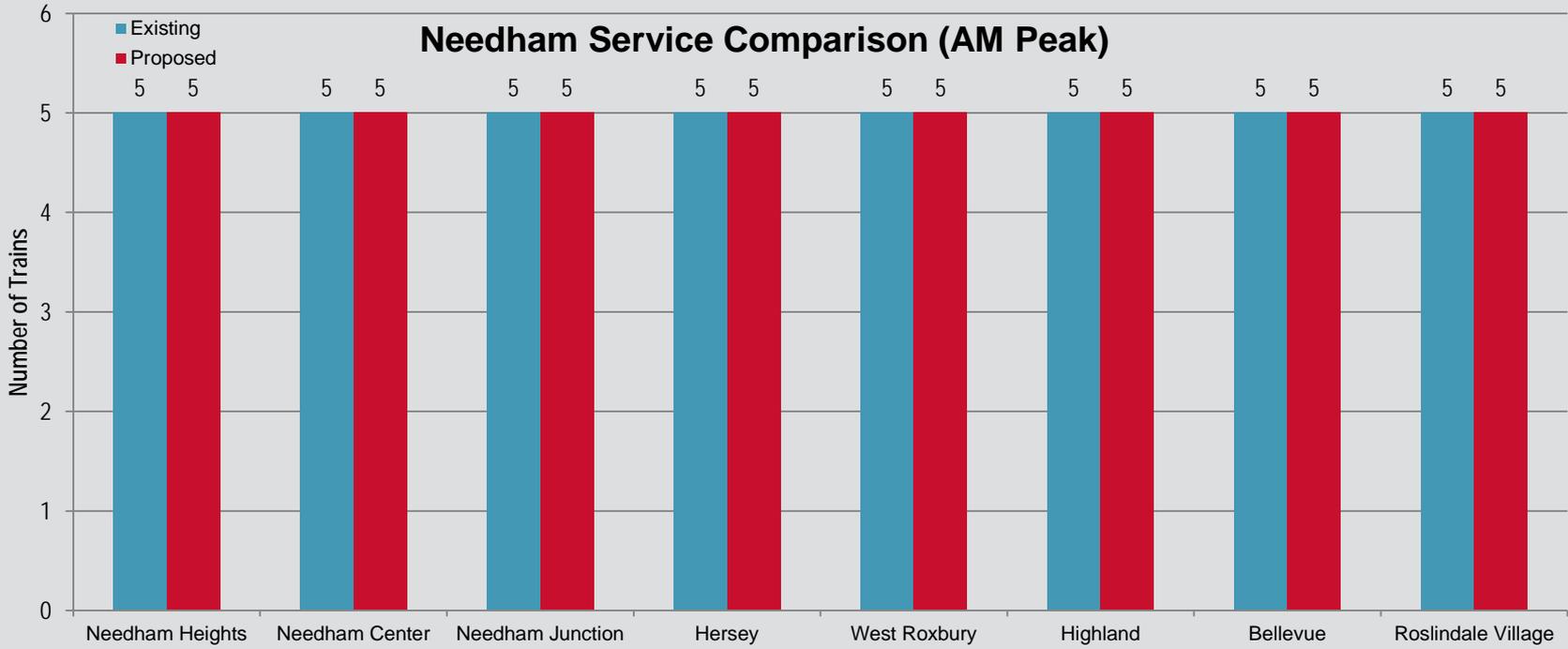
# WORCESTER LINE



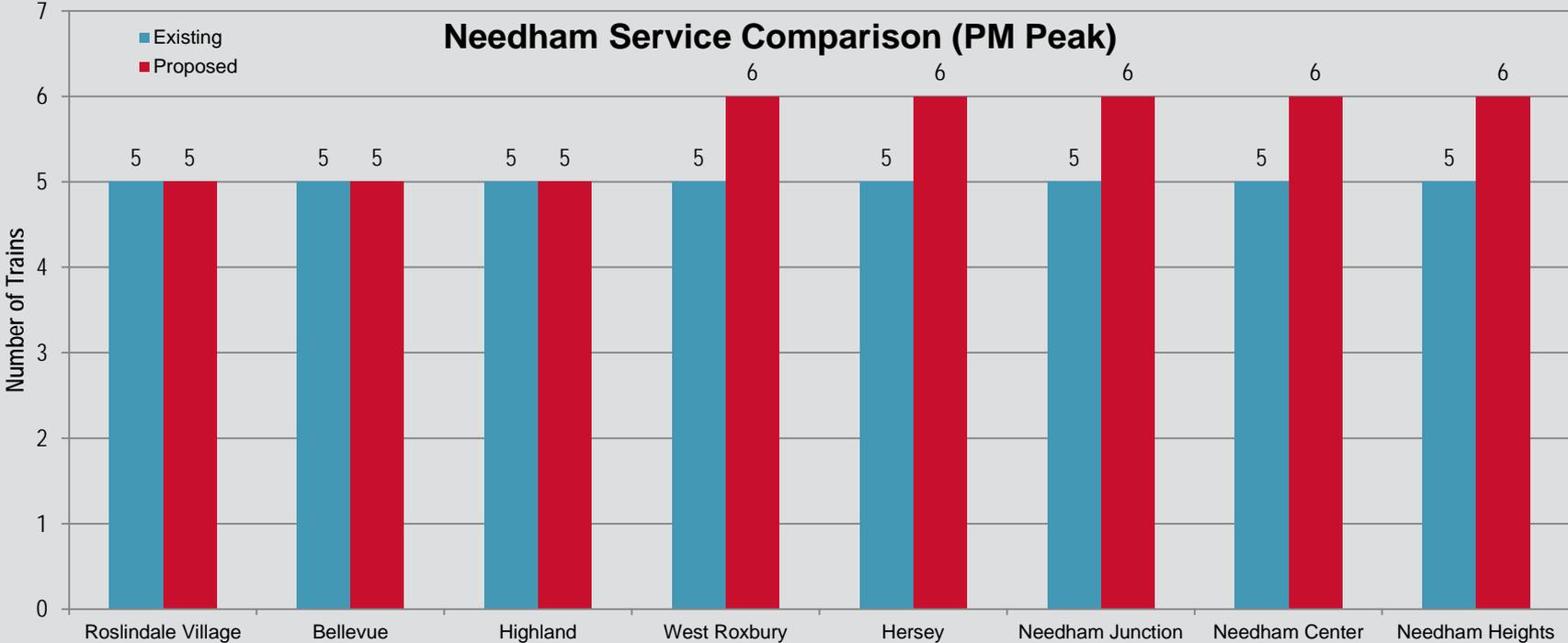
# WORCESTER LINE



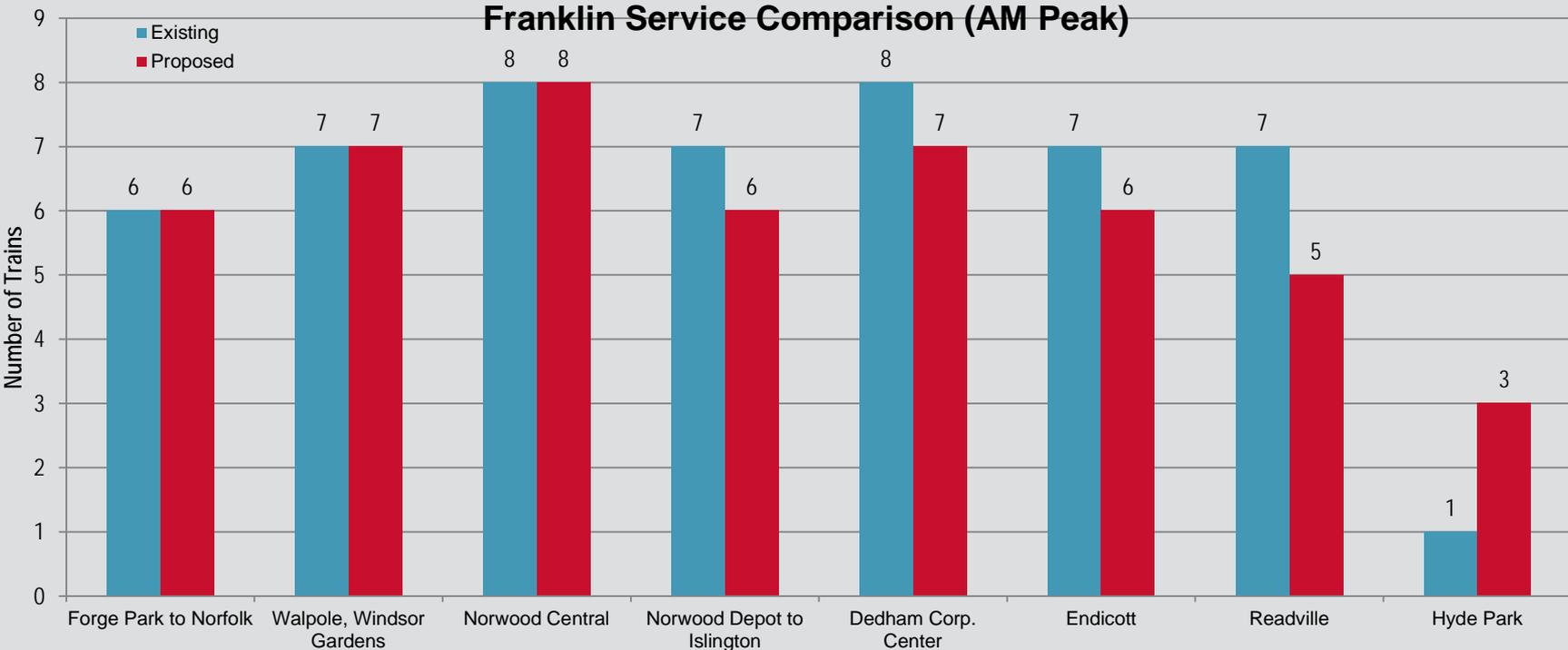
# NEEDHAM LINE



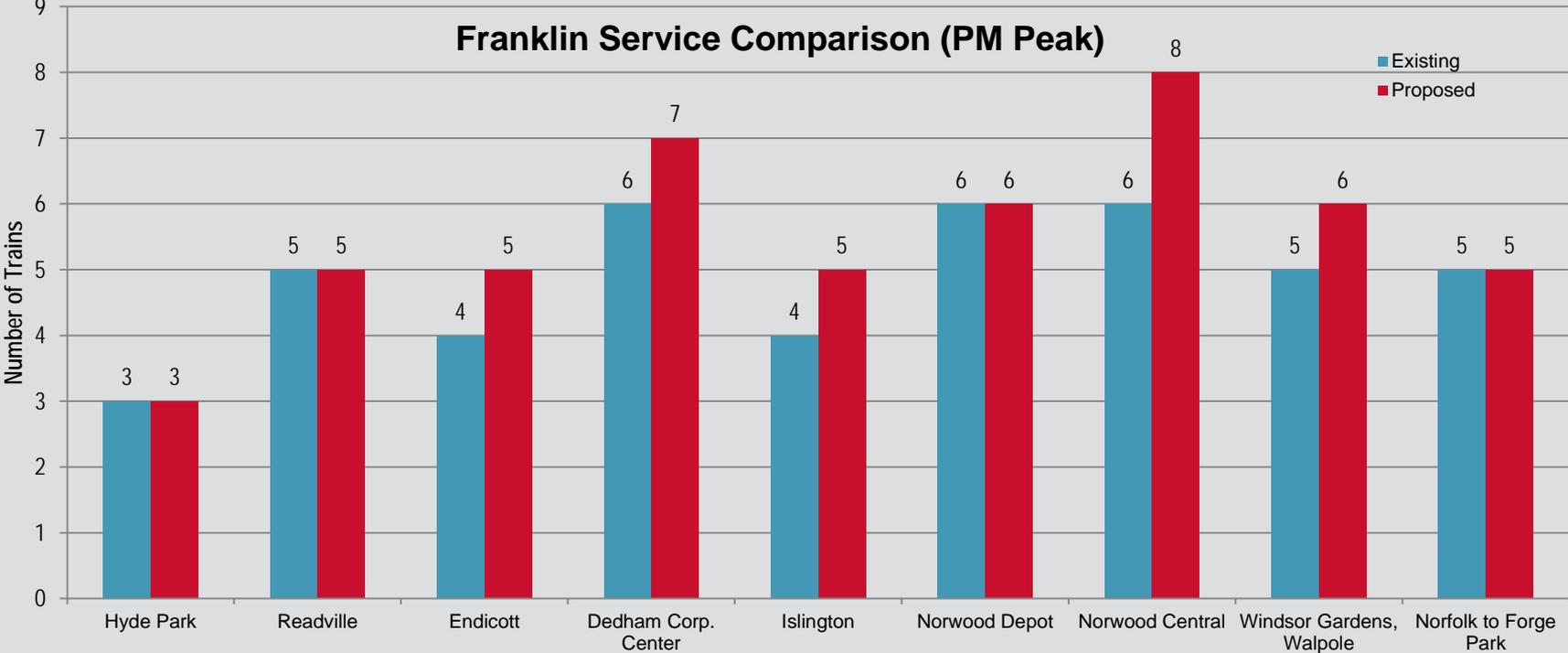
# NEEDHAM LINE



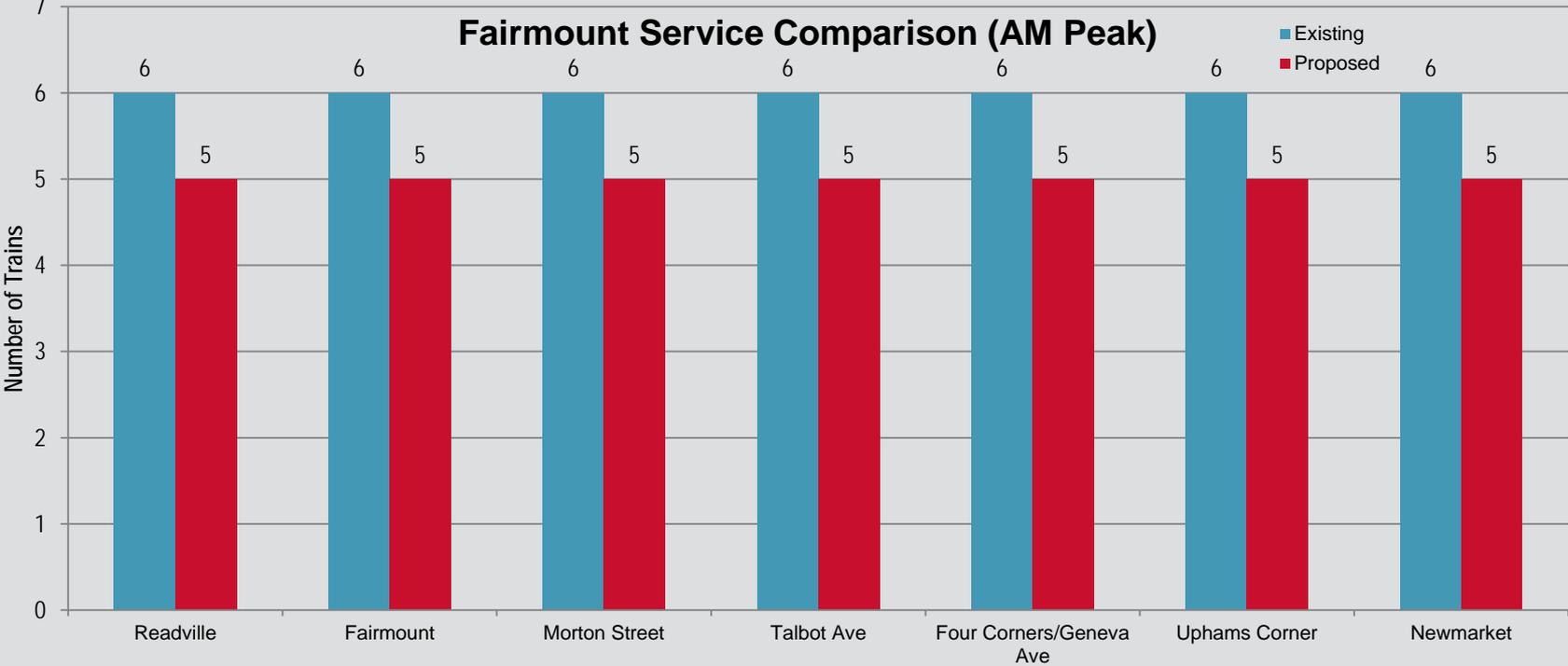
# FRANKLIN LINE



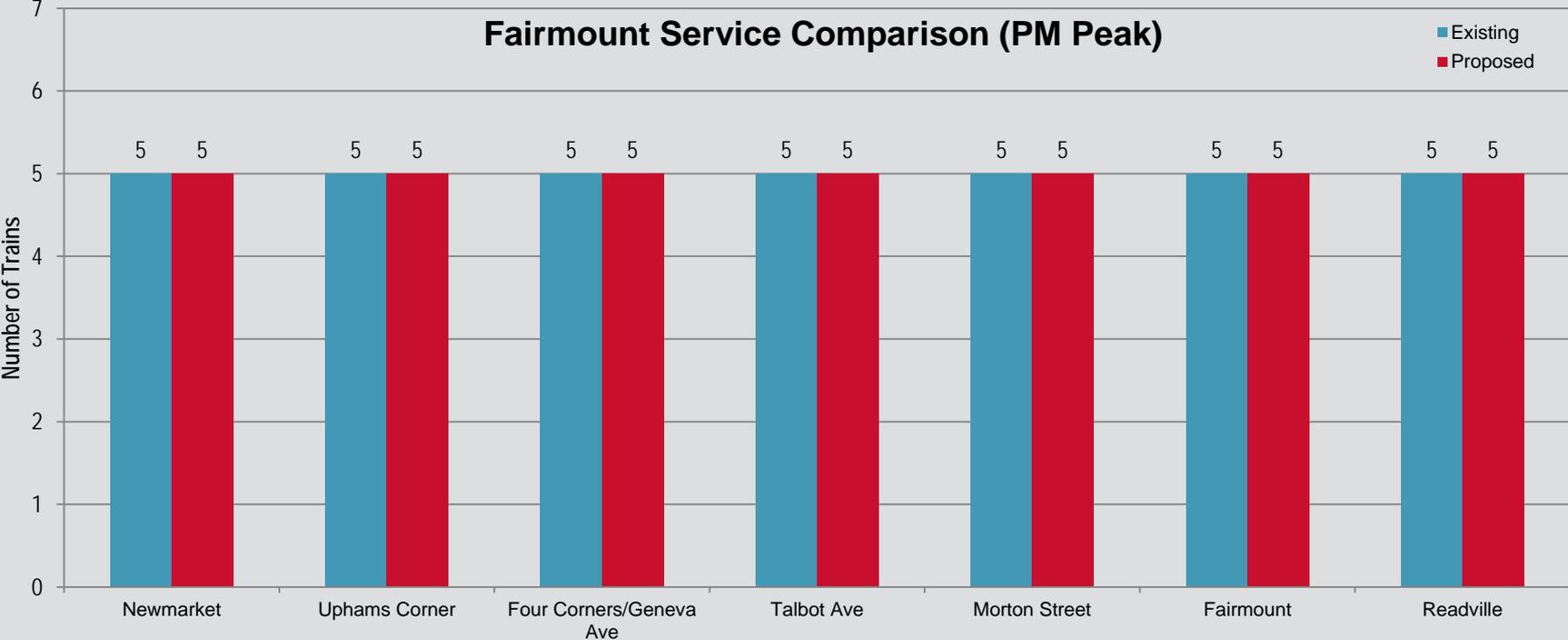
# FRANKLIN LINE



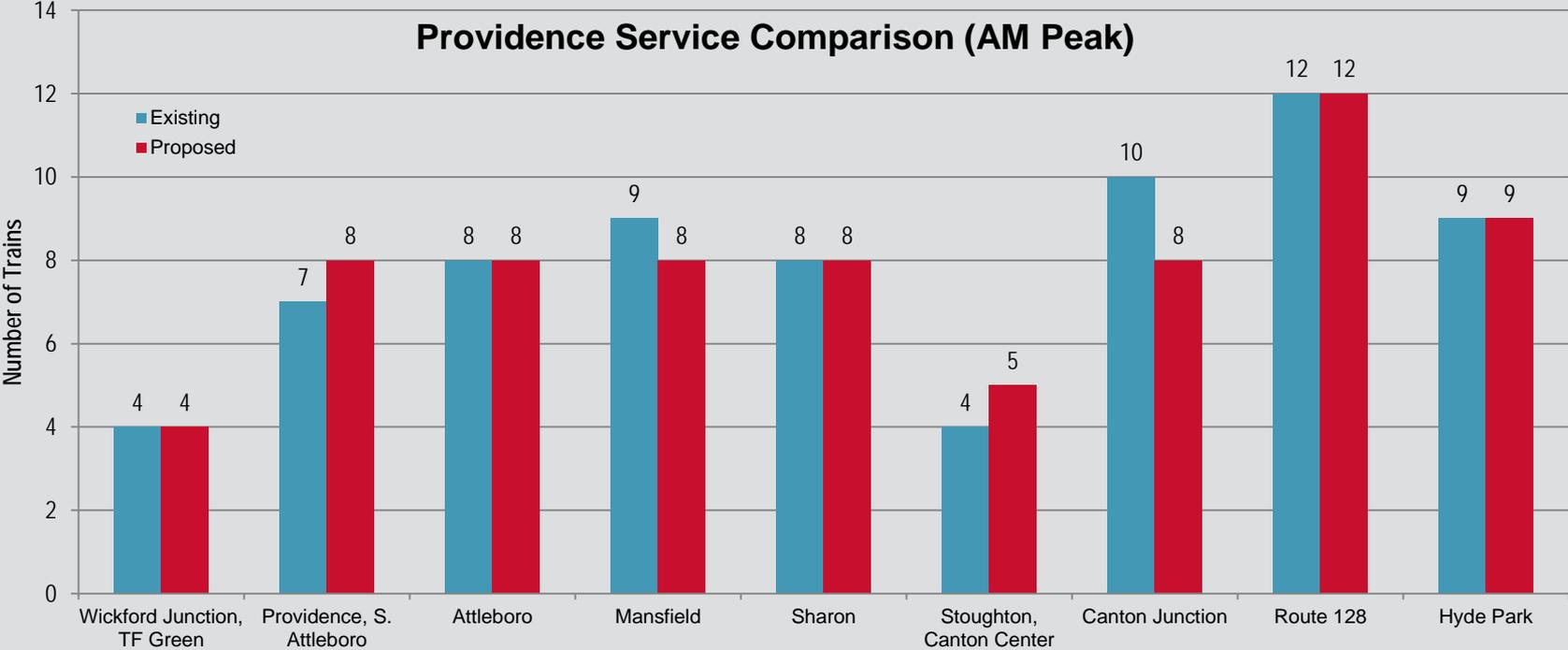
# FAIRMOUNT LINE



# FAIRMOUNT LINE



# PROVIDENCE/STOUGHTON LINES



# PROVIDENCE/STOUGHTON LINES

