

KENDALL SQUARE MOBILITY TASK FORCE

Meeting #8

Grand Junction Feasibility Workshop

October 25, 2016



for



TASK FORCE SCOPE

- Scope leading up to workshop:
 - Compile and update information related to the Grand Junction rail ROW and the feasibility of various transit technologies on the corridor
 - Consider the interaction of transit and the multi-use path
- Today, develop a common understanding on:
 - Desired connections
 - Desired frequency and cross section
 - Feasibility of technology options on the corridor

TASK FORCE SCOPE

- Format of workshop:
 - Presentation of information
 - Discussion targeting input from task force members
- Goal of workshop:
 - Collect input leading to draft recommendations, short term and long term
 - Provide the City with guidance when designing the multi-use path to not preclude future transit

GRAND JUNCTION WORKSHOP



AGENDA

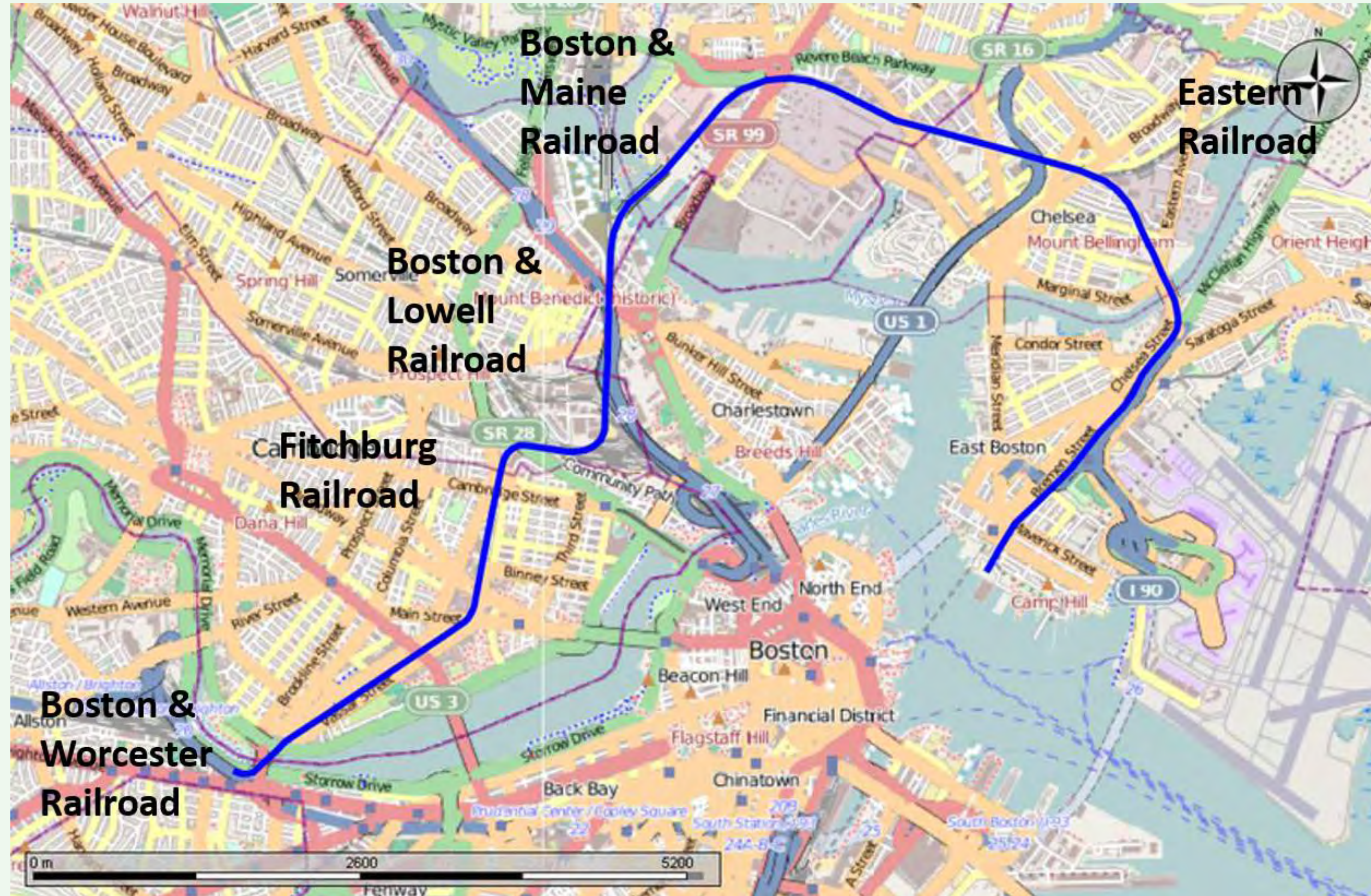
- Background on the Grand Junction
- Possible Transit Uses (Connections/Functions)
- Frequency
- Technology
- Right-of-Way
- Provision for the Future



BACKGROUND ON THE GRAND JUNCTION

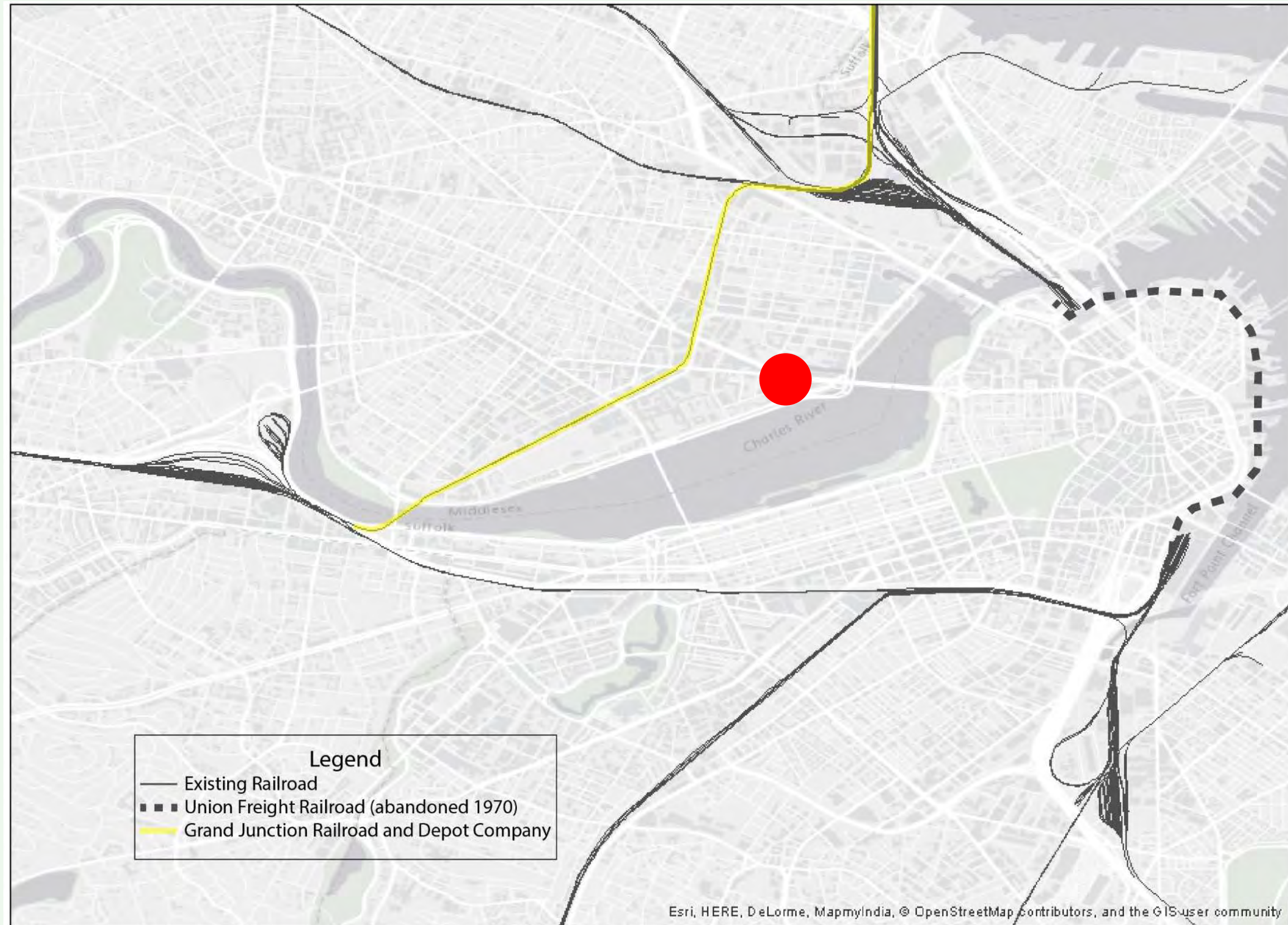


GRAND JUNCTION RAILROAD AND DEPOT COMPANY C. 1856



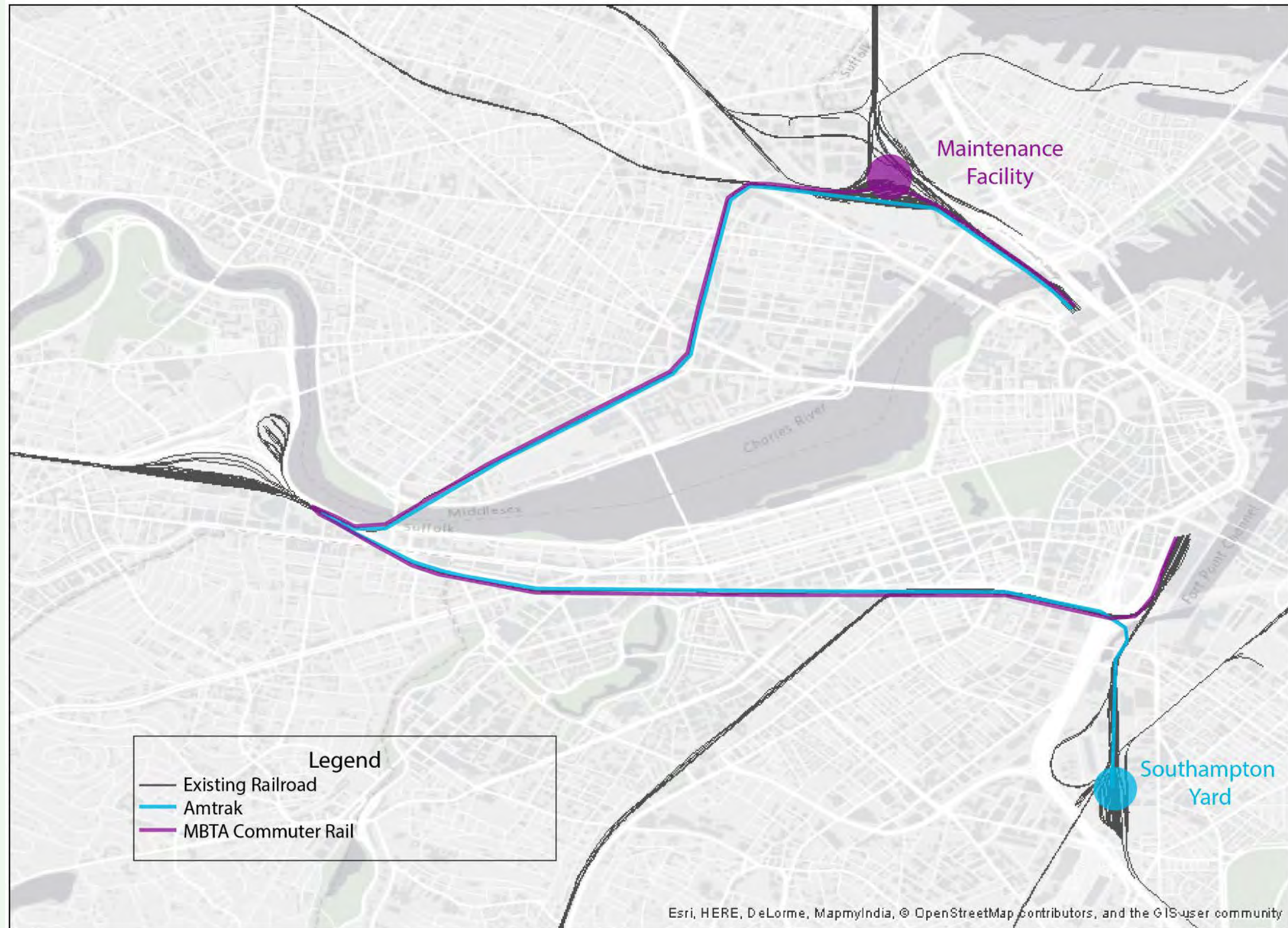


RAILROAD CONTEXT FOR THE GRAND JUNCTION





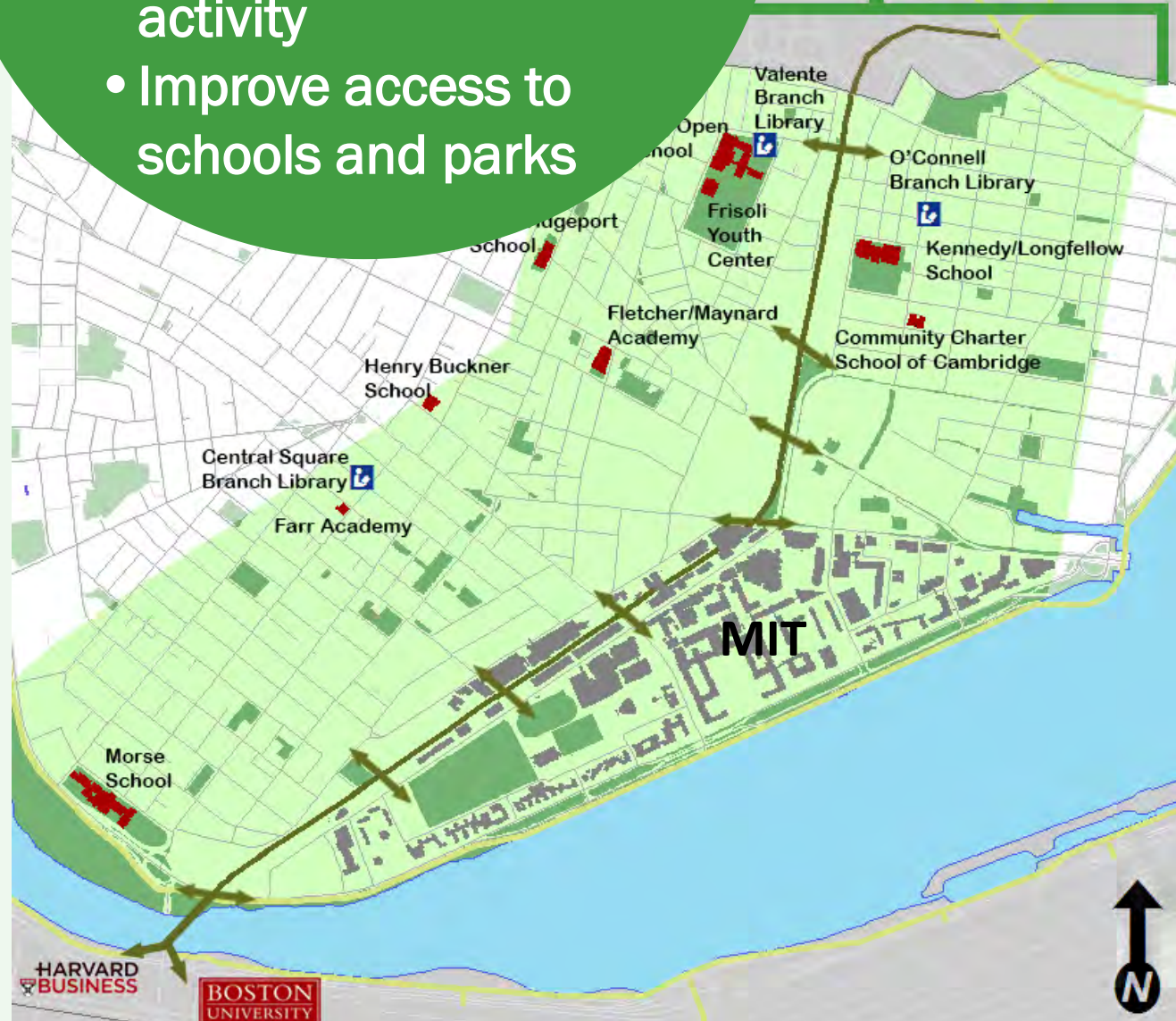
PRESENT RAILROAD USE: UNSCHEDULED 'EQUIPMENT' MOVES & LIMITED LOCAL FREIGHT



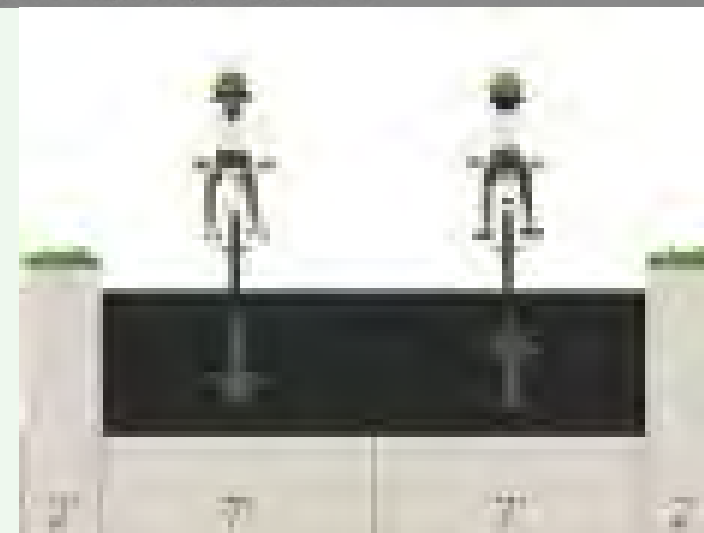


- Over ¼ of Cambridge residents live within ½ mile of path
- Increase public health through access to physical activity
- Improve access to schools and parks

Grand Junction Right of Way
Grand Junction Crossing
Existing/Proposed Area Path
Library
Public or Private School
1/2 Mile Path Corridor
Open Space
MIT Buildings



AN IMPORTANT PLANNED MULTI-USE LINK:



Desired width for
multi-use path: 14'
with 2' buffers



REPRESENTATIVE TREATMENTS



Minneapolis
(MN)
High Frequency



Seattle (WA)
Medium
Frequency



Hartford (CT)
High Frequency

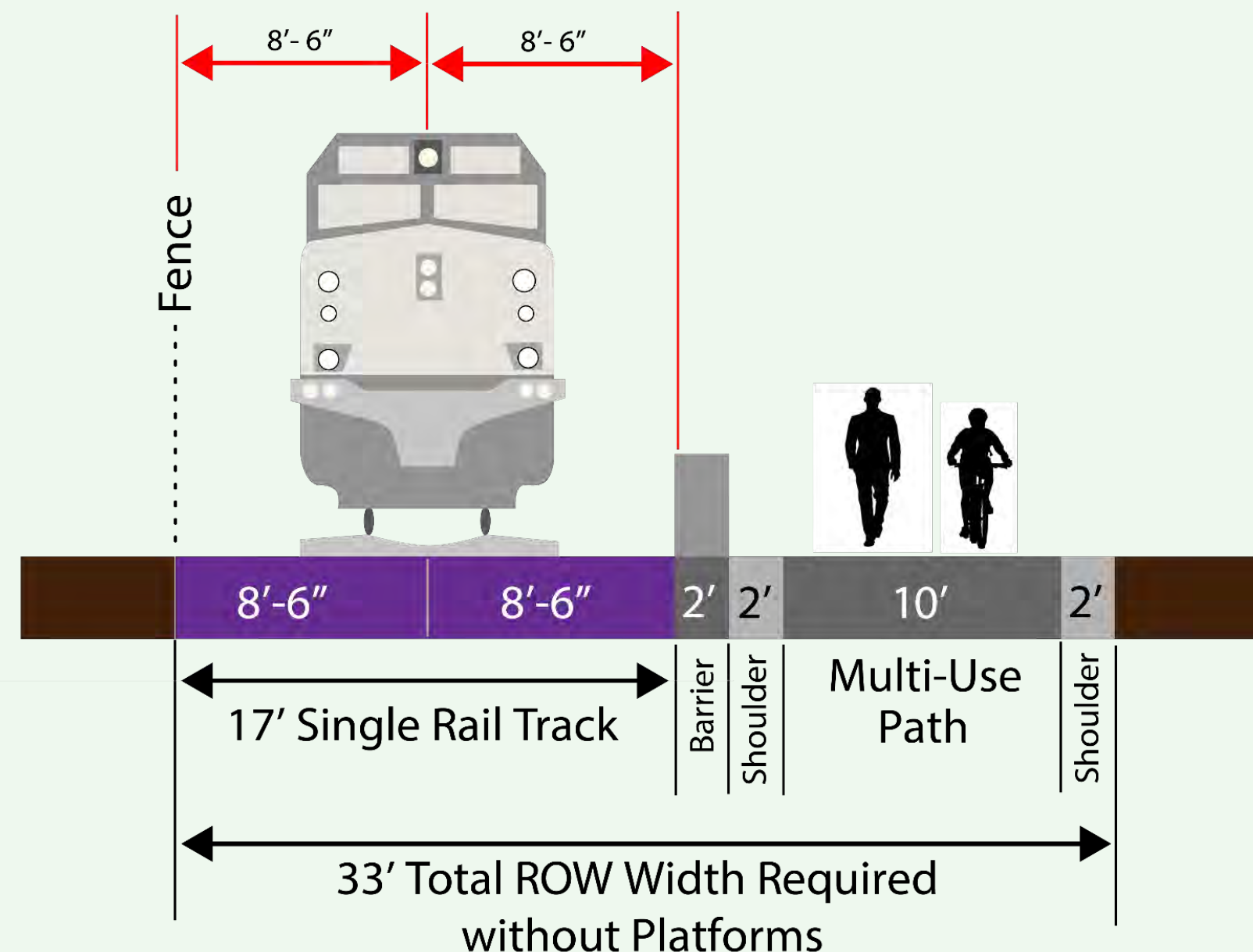


Burlington (VT)
Low Frequency



MINIMUM CONFIGURATION (REQUIRED RAILROAD + PLANNED MULTI-USE PATH)

- Infrequent, low-speed (10 mph) train movements
- ROW for path not always readily available
- At narrowest points, path may need an alternate routing, or more ROW would be required



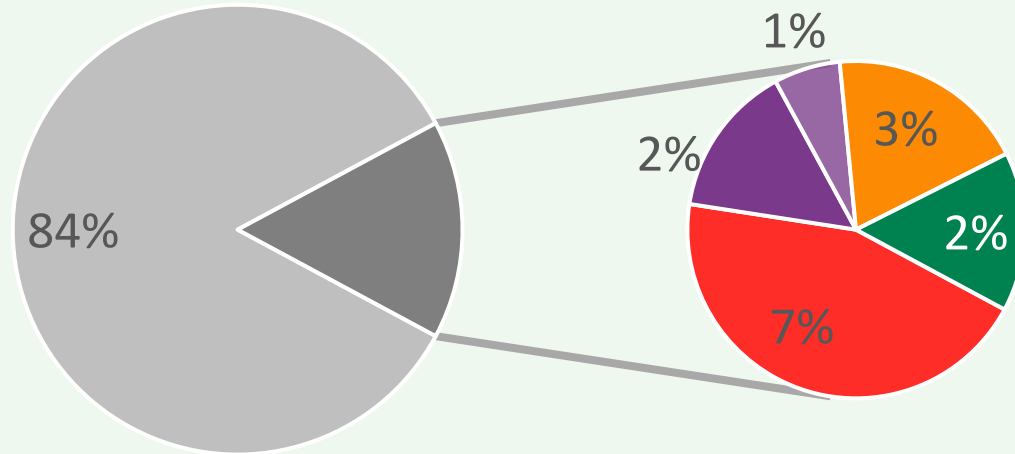


POSSIBLE TRANSIT USES (CONNECTIONS/FUNCTIONS)

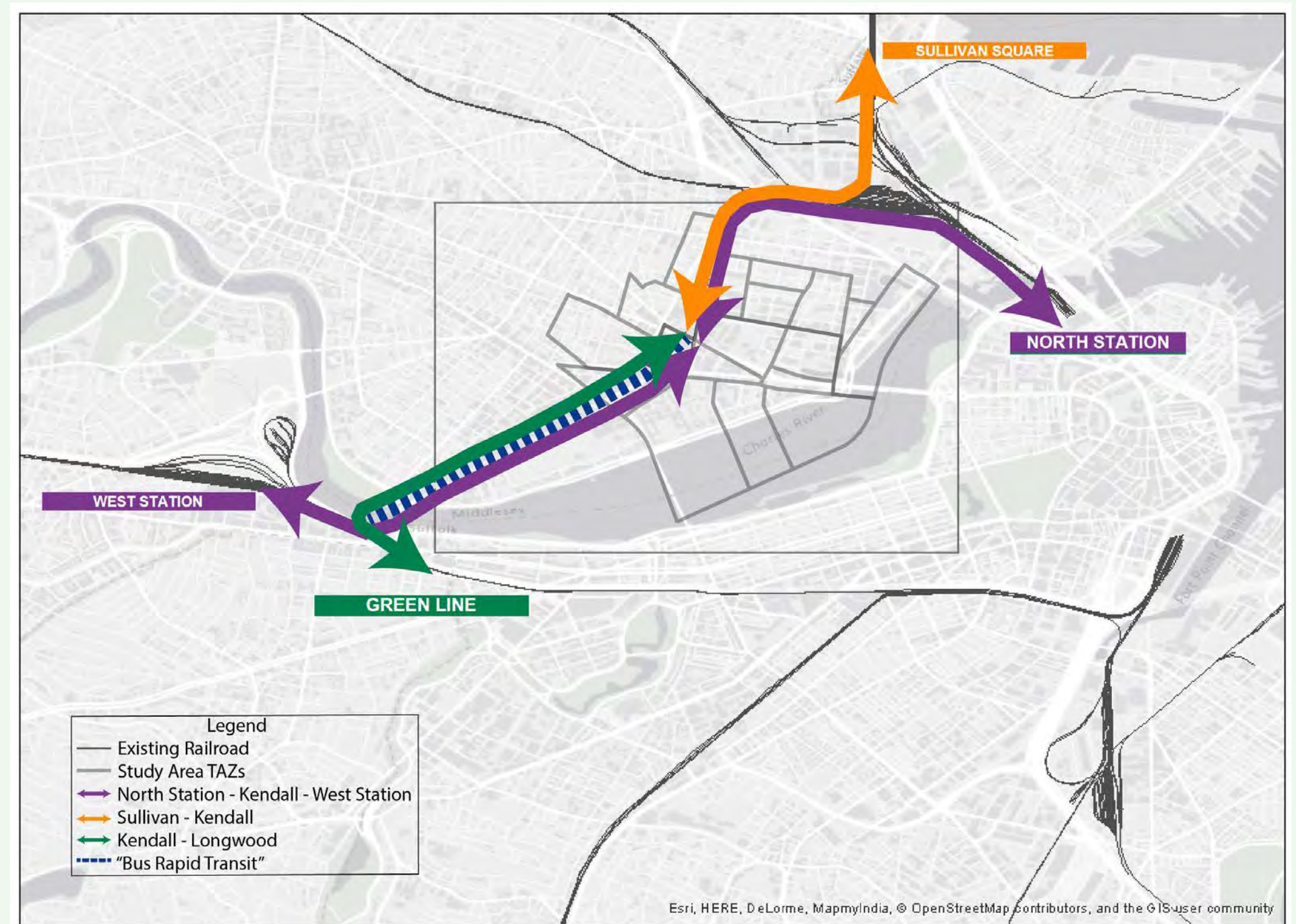


POSSIBLE TRANSPORTATION USES: TRANSIT

Fraction of Transit Trips to
Kendall



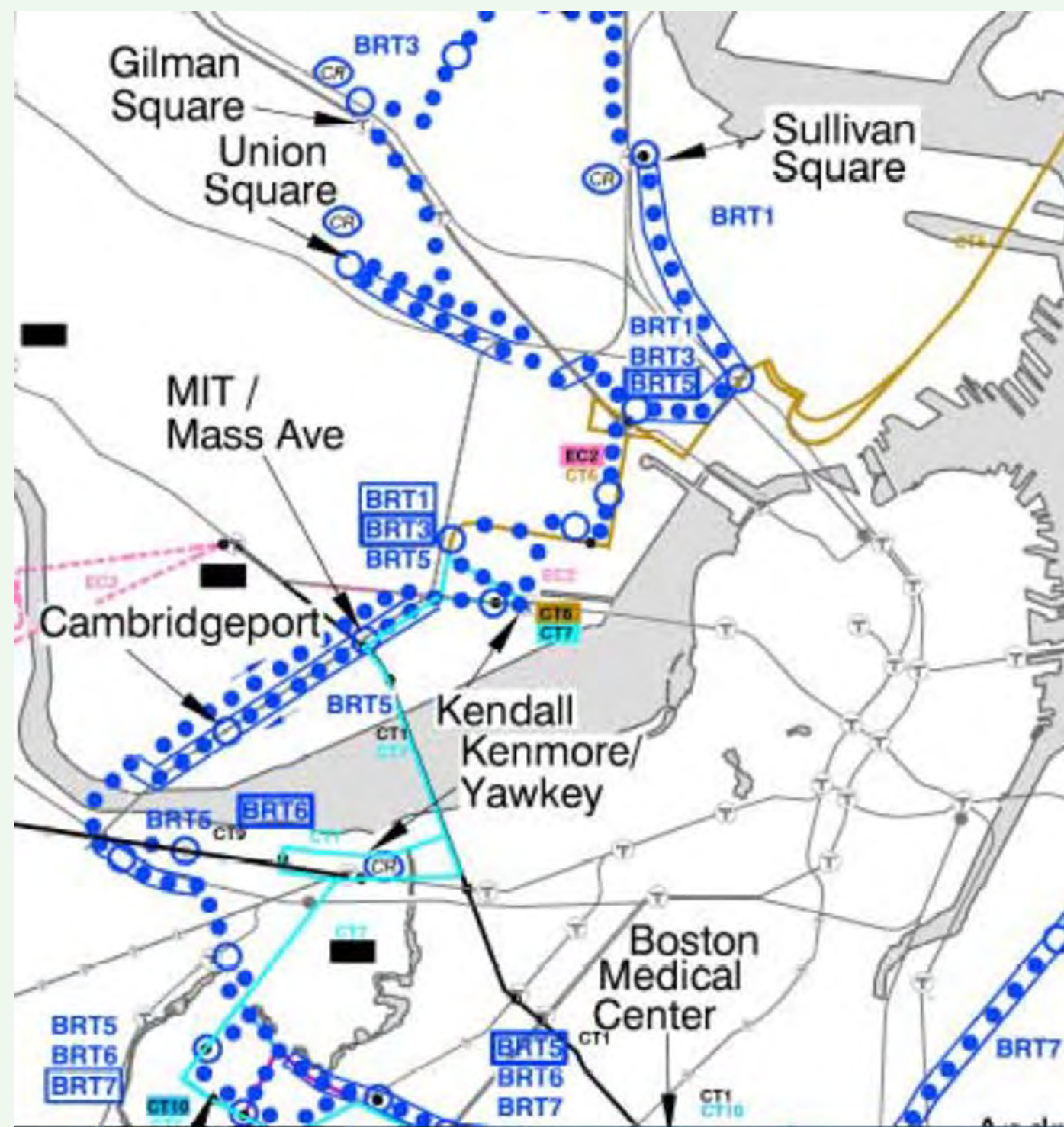
- Red Line and Local Buses
- Commuter Rail via Red Line
- Commuter Rail via North Station
- Worcester Line via South Station
- Orange Line North of North Station
- Green Line West of Kenmore





PRIOR PROPOSALS FOR TRANSIT USE

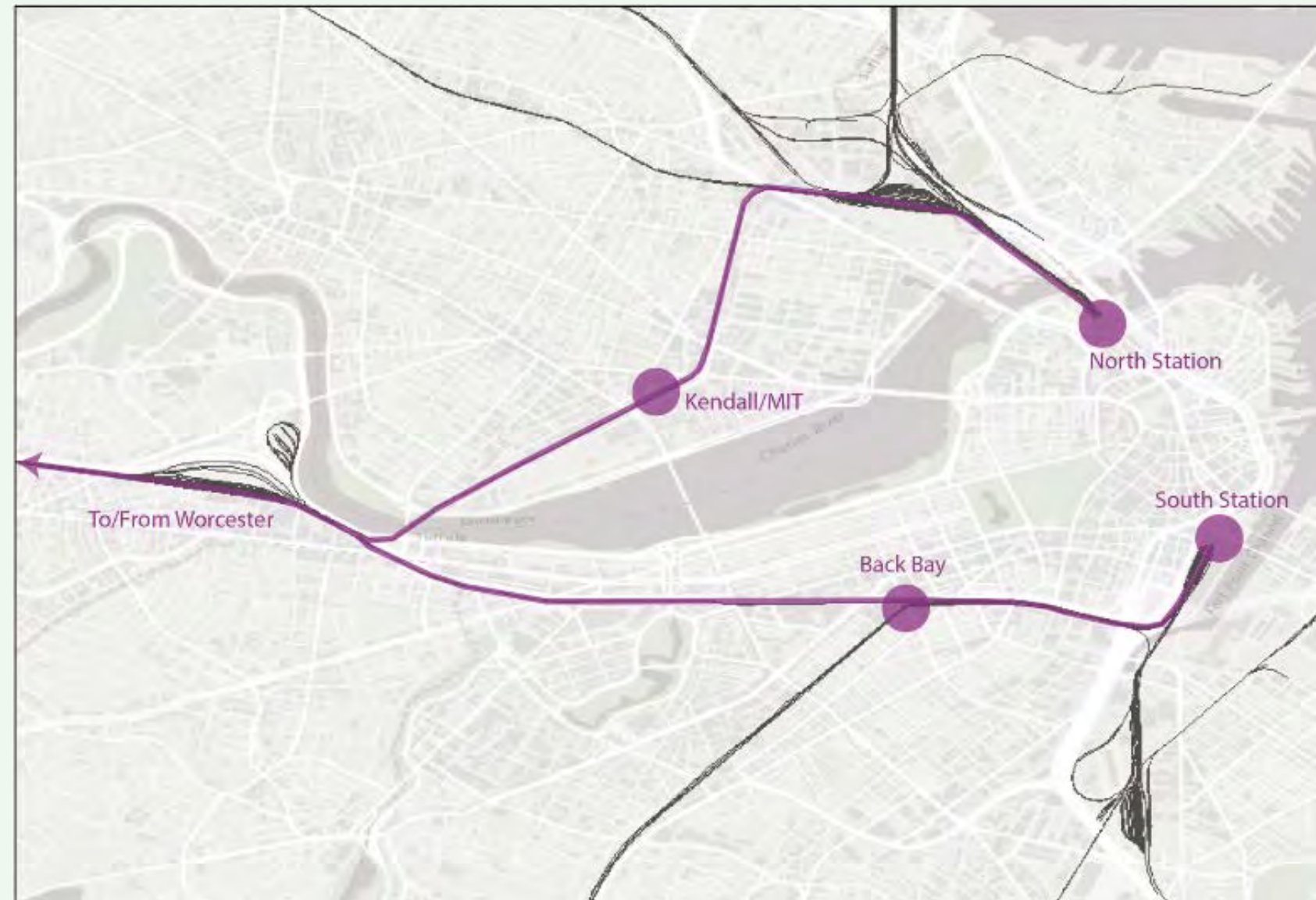
- **Urban Ring**
 - Bus Rapid Transit on Grand Junction south of Main St.
 - Suspended in 2010 (high costs)
- Worcester Line commuter rail
 - Some trains to/from North Station via Grand Junction
 - Not going ahead; South Station will be expanded
- Barr Foundation/ITDP (2014)
 - Part of a potential BRT corridor
- ‘DMUs’
 - Various proposals (2012-2014)





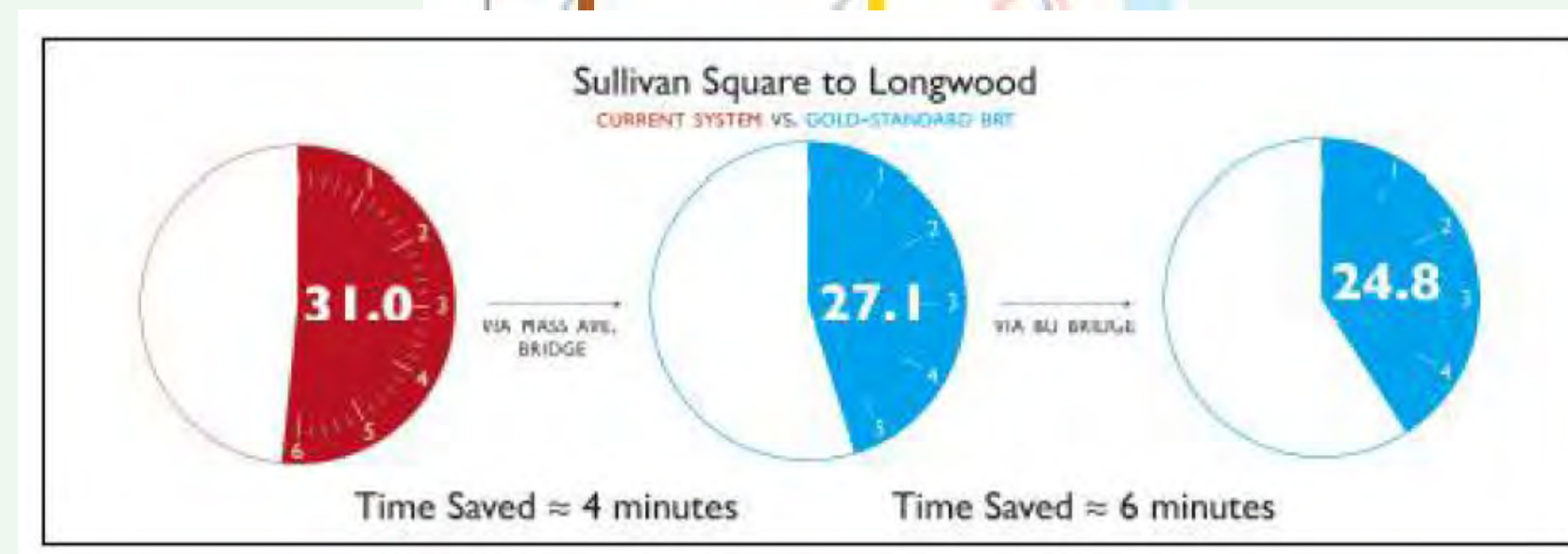
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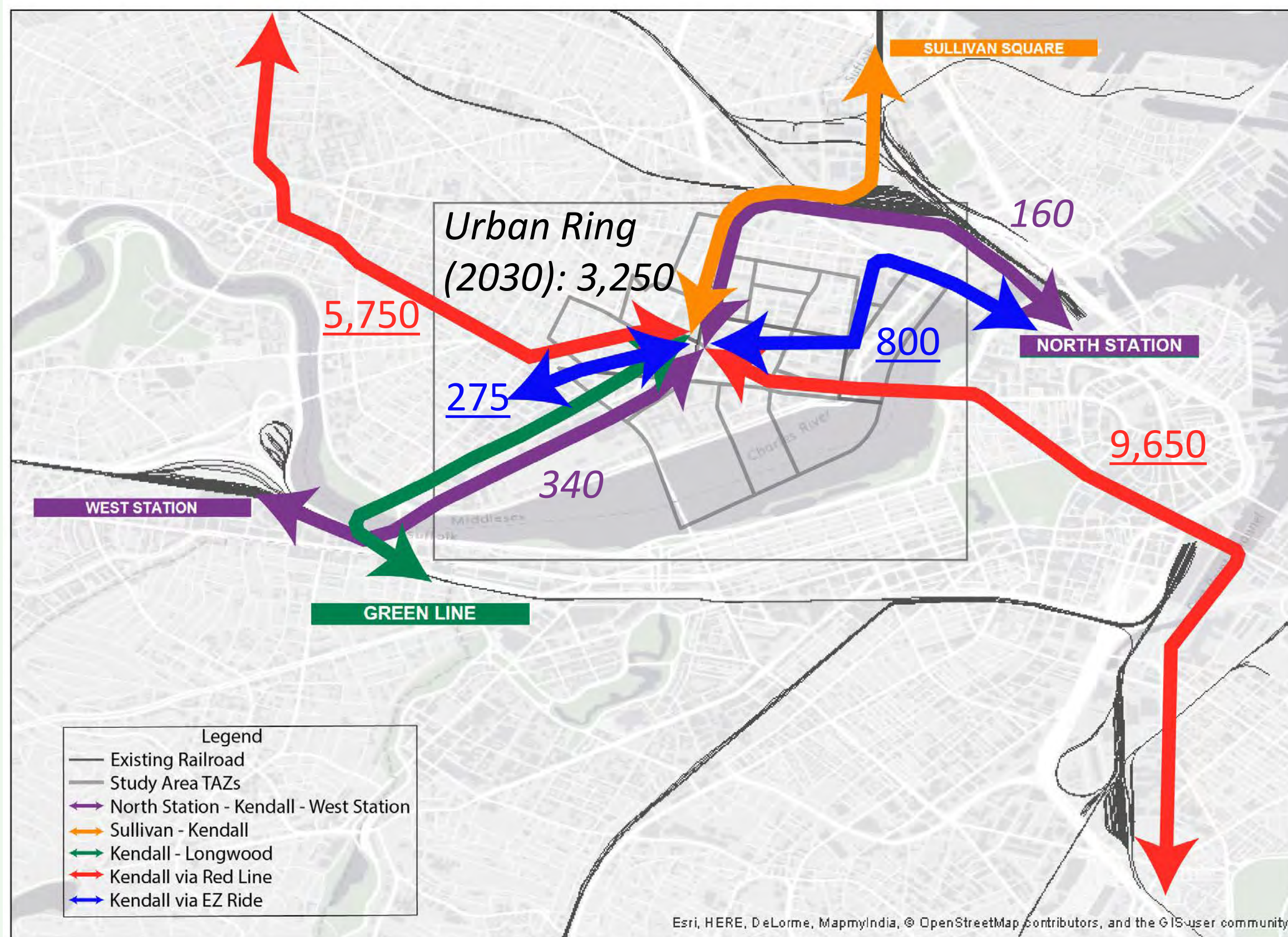
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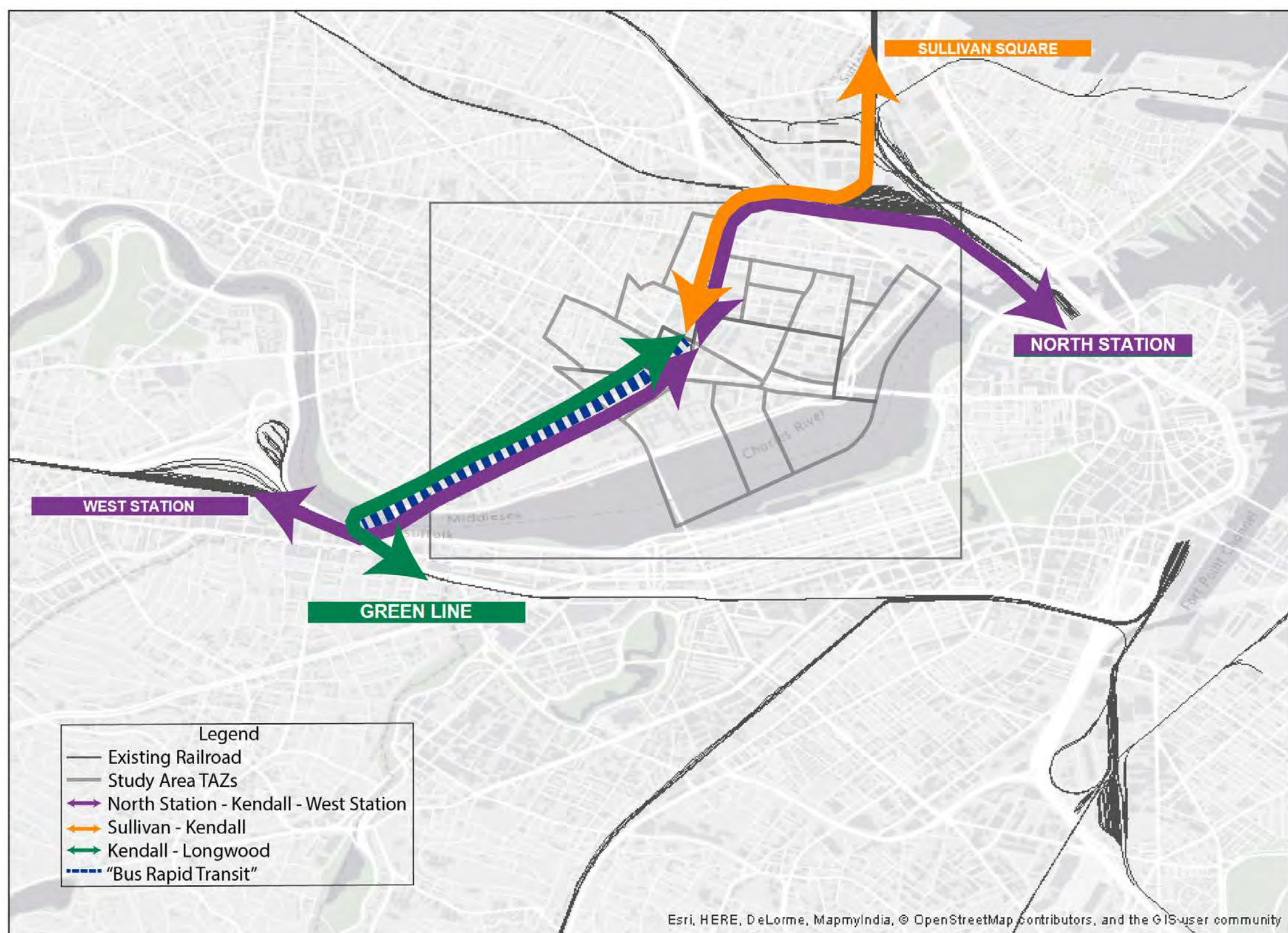
PROPOSED TRANSIT USES: FORECAST AND SELECTED EXISTING VOLUMES



Daily trips originating/terminating in the study area: Existing & *Forecasted*



DISCUSSION: WHAT CONNECTIONS SHOULD BE ACHIEVED?



FREQUENCY

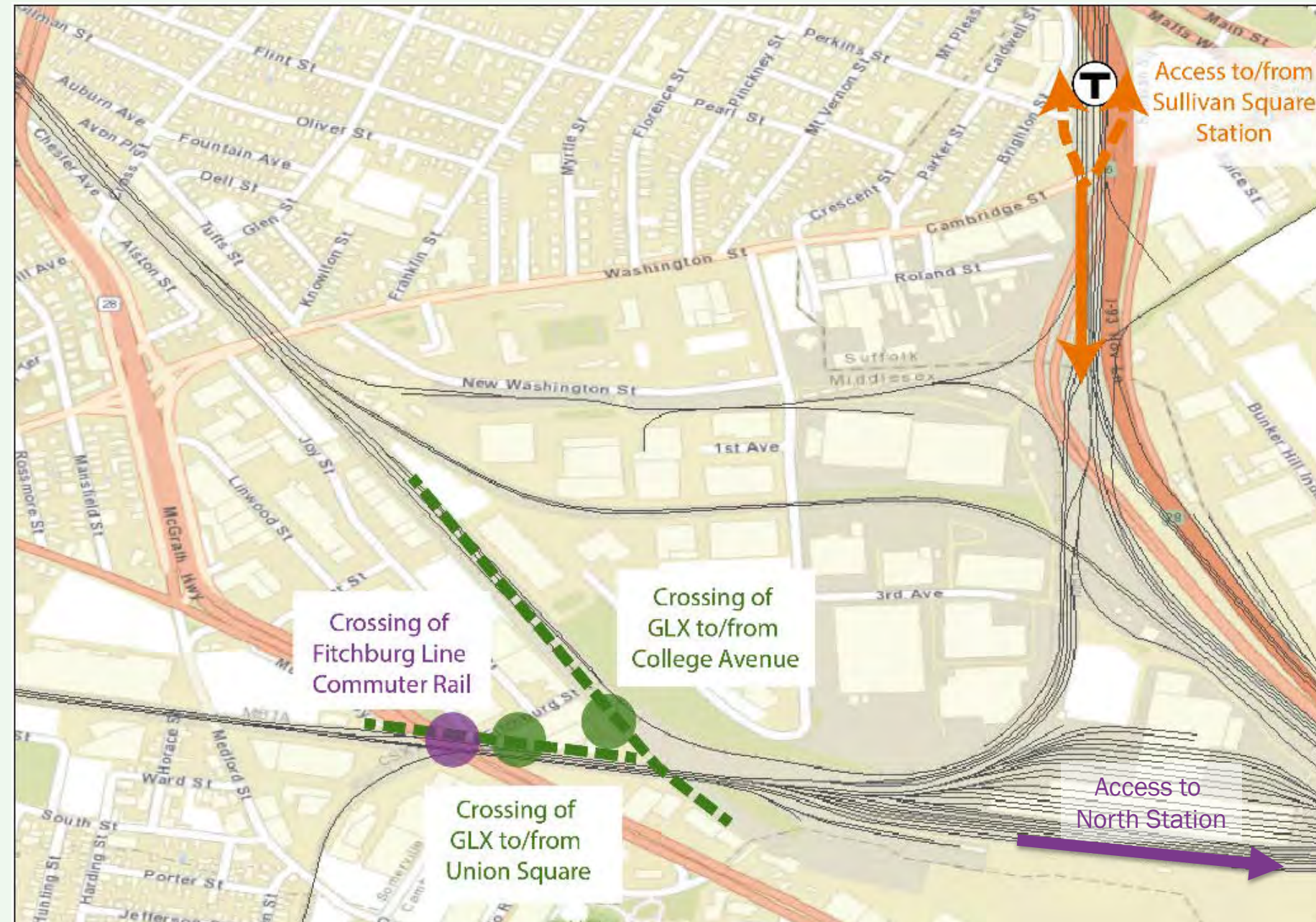
FREQUENCY RELATES TO FUNCTION

Service Frequency Class	Regional/ Commuter	Intermediate	Rapid Transit
Local Example	Fitchburg Line	Silver Line (Airport)	MBTA Red Line
Trips per hour per direction in peak	1-4	4-10	10-30
Dedicated track or lane for each direction?	Sometimes	Often	Almost always
Typical distance between stops (mi)	2 or more	0.2-1.0	0.4-1.2
Typical average speed (mph)	25-35	10-20	15-25
Implementation Costs	Low to Moderate	Moderate to High	High to Very High



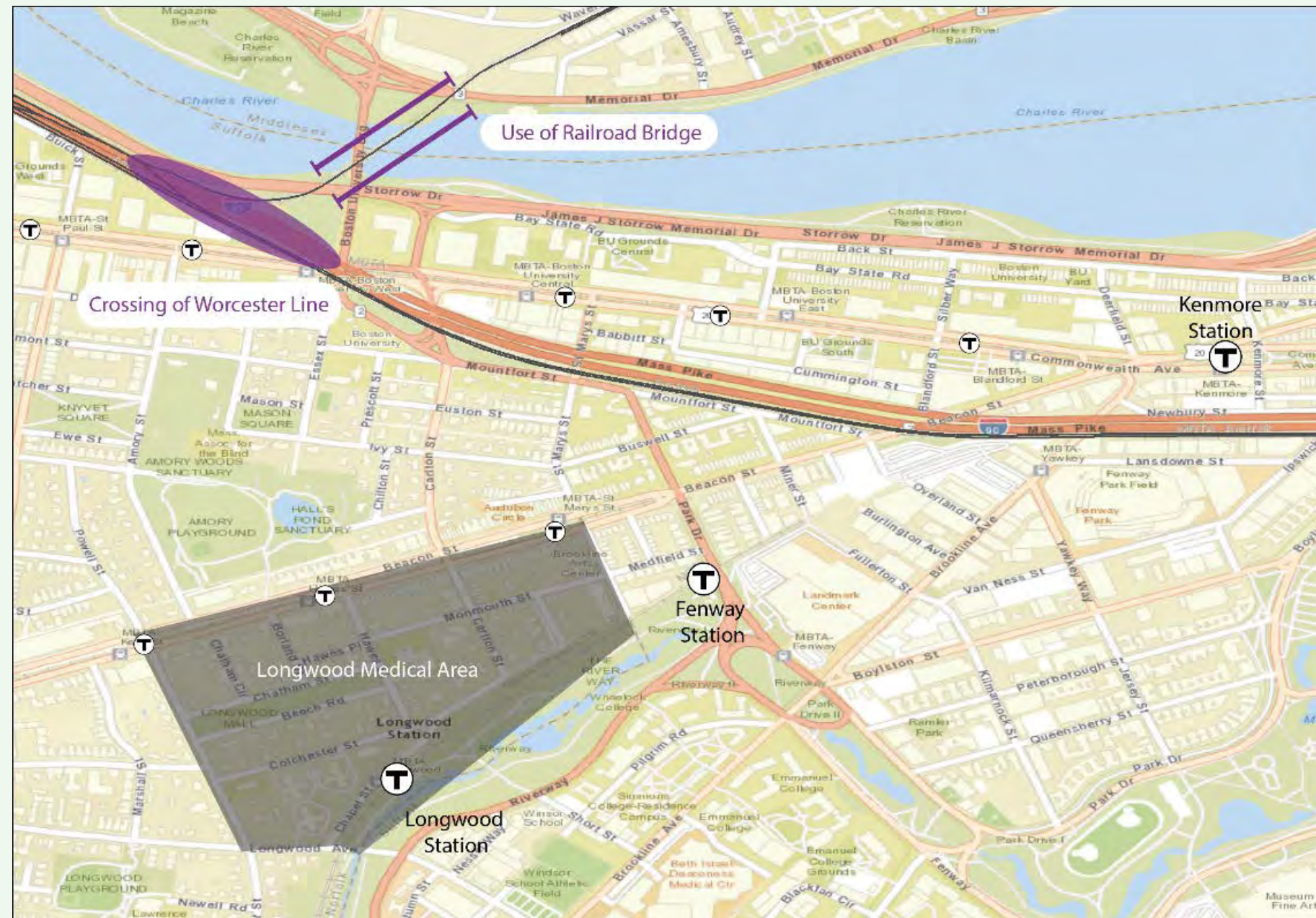
ISSUES FOR FREQUENT TRANSIT SERVICE: NORTH END (CAMBRIDGE ST TO SULLIVAN SQUARE)

- Crossing of Fitchburg Line commuter rail
- Crossings of Green Line Extension (2)
- Access to/from Sullivan Square Station and North Station



Regional/ Commuter	Intermediate	Rapid Transit

ISSUES FOR FREQUENT TRANSIT SERVICE: SOUTH END (MIT TO LONGWOOD)



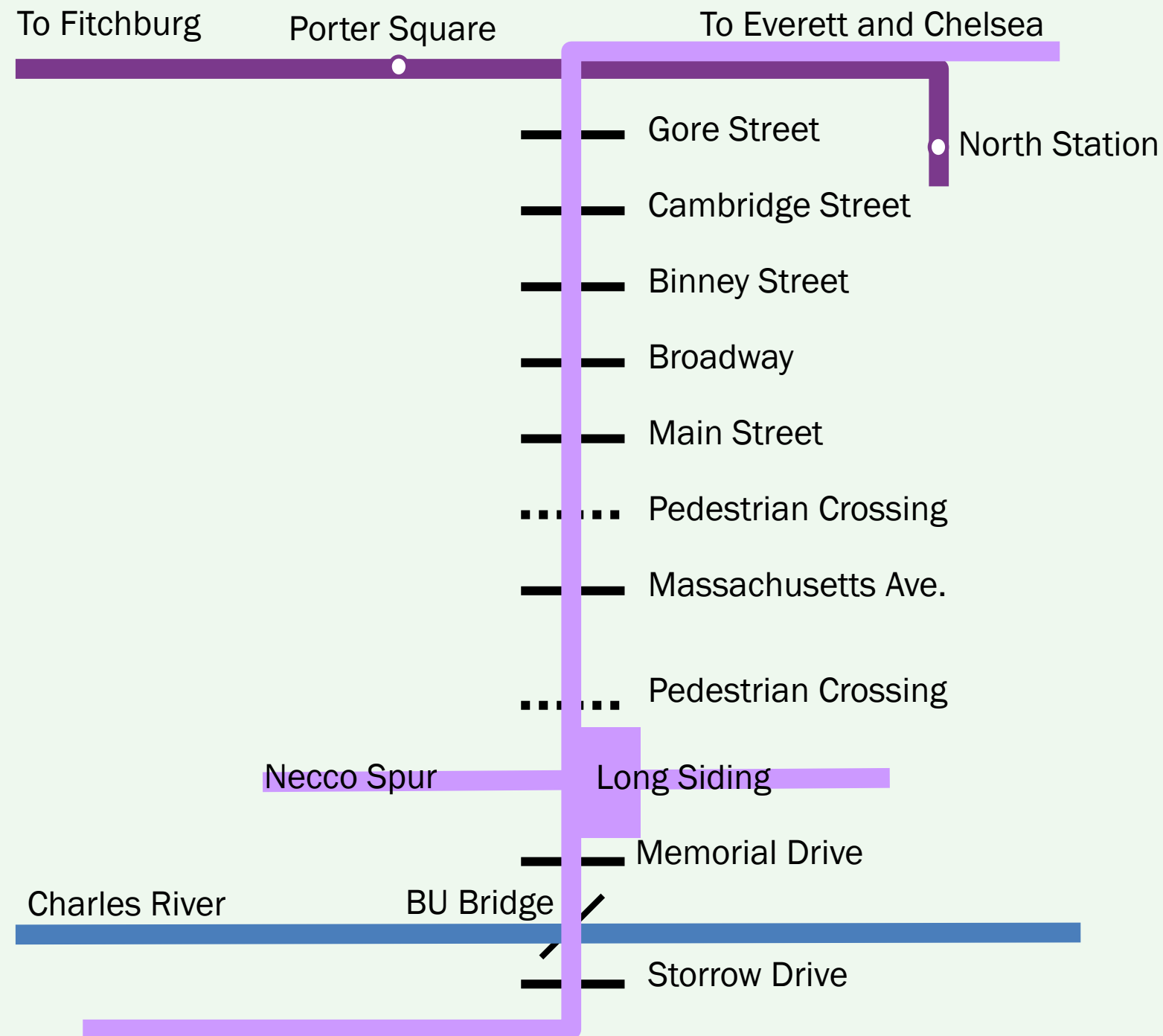
- Use of 'BU' railroad bridge
- Crossing of Worcester Line commuter rail
- Terminal location, especially for rail concepts
- Green Line connections

Regional/ Commuter	Intermediate	Rapid Transit



ISSUES FOR FREQUENT TRANSIT SERVICE

CONCEPTS: AT-GRADE CROSSINGS WITH STREETS

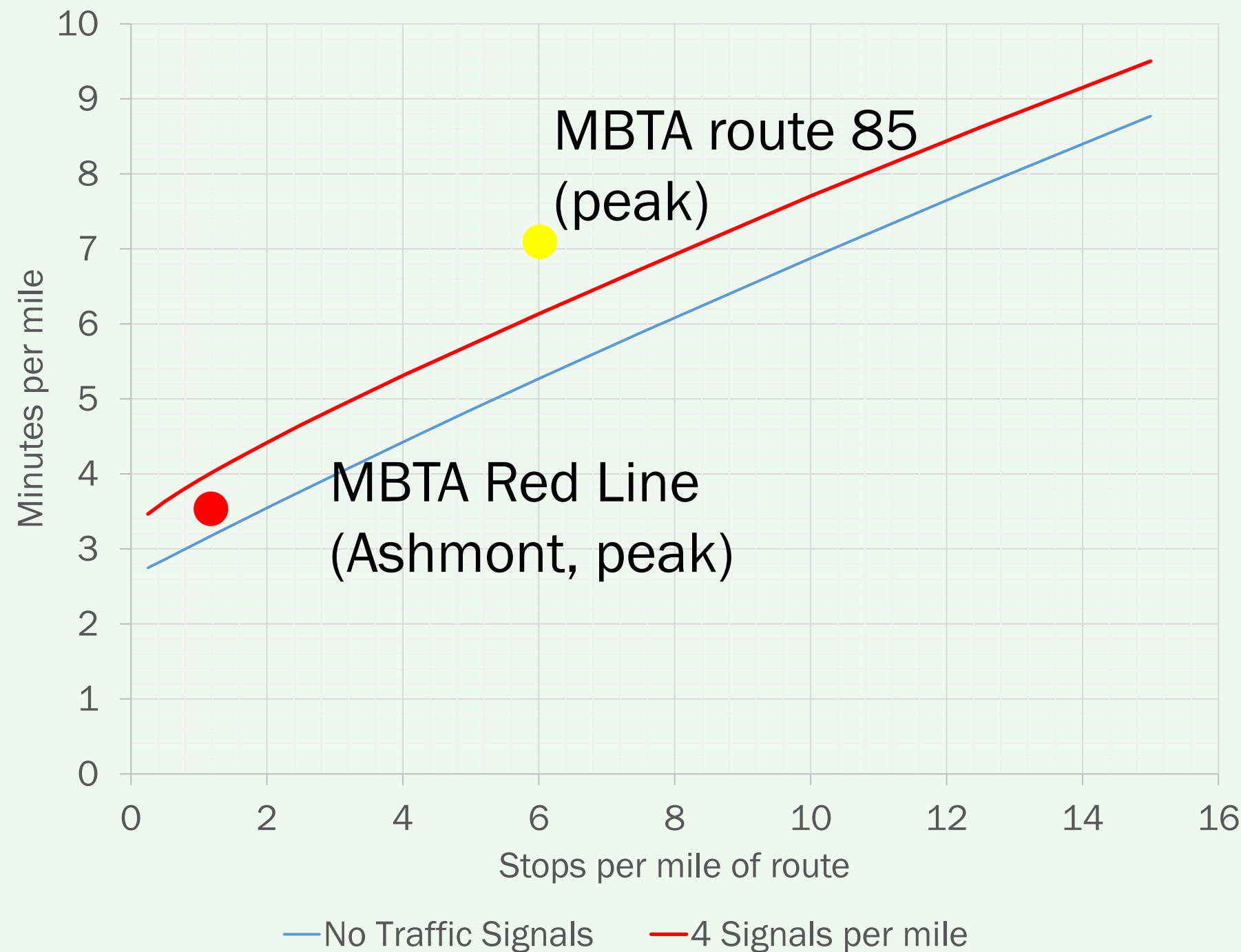


- If crossings are *pre-empted* (e.g. with gates and flashers) traffic delays increase with service frequency. Modest impacts were identified for the infrequent Worcester Line trains to/from North Station
- Alternative is traffic signals - each signal has about 40% of the effect on speed as adding a stop or station

Regional/ Commuter	Intermediate	Rapid Transit

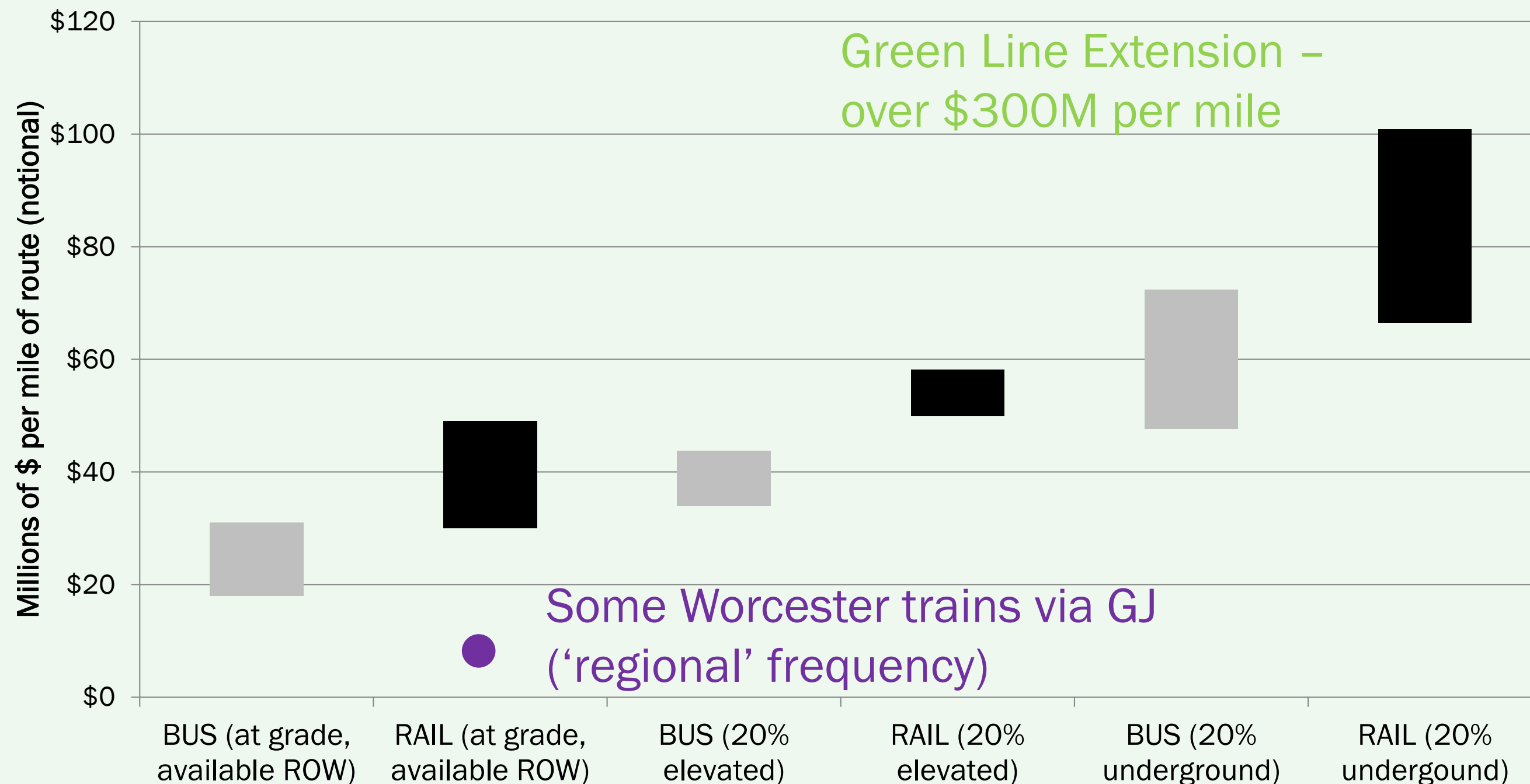


EFFECTS OF TRAFFIC SIGNALS AND STOP SPACING



- Short stop-to-stop distances cause delays even when the runningway is exclusive to transit
- Frequent stops *and* signals slow the present bus services in Cambridge (to 7-8 mph)

OVERCOMING THESE FREQUENCY ISSUES CAN BE EXPENSIVE, FOR BOTH RAIL *AND* BUS







An aerial photograph of a city skyline, likely Boston, featuring a river in the foreground with several sailboats. The city is densely packed with buildings of various heights and colors, including a prominent tall, light-colored building in the center. The background shows a hazy horizon with distant hills.

TECHNOLOGY



WHAT IS A 'DMU' ANYWAY? DIESEL MULTIPLE UNIT

	Locomotive-hauled	Multiple Unit (MU)
Diesel-electric		
'Straight' electric		



ANOTHER DIMENSION: FRA REQUIREMENTS

- North American crash energy management approach differs from transit (subject to FTA) and overseas rail
- No joint (shared) use of track without an FRA waiver with *strict* time separation
 - Time of day (prevalent)
 - Advanced Temporal Separation (NJT RiverLINE)





FRA-COMPLIANT DMUs (1 of 2)



Budd Rail Diesel Car (RDC);
398 were built between 1949
and 1952.

- Three separate attempts to develop a successor the classic ‘RDC’ have been commercial failures
 - Hawker-Siddeley (c. 1965)
 - Budd SPV 2000 (c. 2000)
 - Colorado Railcar (c. 2010)
- Notwithstanding, interest in such a product for lower-volume routes remains strong



FRA-COMPLIANT DMUs (2 of 2)



Fredrick D. Joe/ *The Oregonian*

Colorado Railcar product for
Westside Express Service (WES),
Portland Tri-Met



US Railcar

Bilevel Colorado Railcar product for
South Florida RTA (Tri-Rail). A
similar vehicle was proposed for
MBTA's 'Indigo Line'



NON-COMPLIANT DMUS IN NORTH AMERICA



Stadler GT6 DMU
New Jersey Transit River
LINE



Bombardier Talent BR643
OC Transpo O-Train
(Ottawa)



‘WIRELESS’ ELECTRIC LIGHT RAIL (NOT FRA COMPLIANT)



CAF Urbos 3 for Kaohsiung, Taiwan

FRA non-compliant electric light rail vehicles can charge intermittently, avoiding the need for continuous overhead contact systems. Limited applicability for high speeds or long distances between stations



FREQUENCY AND TECHNOLOGY

- Frequency is *more* important than technology for determining:
 - Width of ROW required (number of tracks or lanes)
 - Treatment of street crossings
 - Need for expensive structures
- Technology is *not* important to travel time if the max speed, alignment, stops, and control arrangements are the same
- Technology *does* relate to: noise, localized emissions, perception, image, and operating cost



DISCUSSION: FREQUENCY CLASS AND TRANSIT USES FOR THE GRAND JUNCTION

General Service Frequency Class	Regional/ Commuter	Intermediate	Rapid Transit
Local Example	Fitchburg Line	Silver Line (Airport)	MBTA Red Line
Trips per hour per direction in peak	1-4	4-12	10-20
Dedicated track or lane for each direction?	Sometimes	Often	Almost always
Implementation Costs	Low to Moderate	Moderate to High	High to Very High
Notional Range of Daily Capacity (one way) in the corridor	1,500 – 7,000	3,000-15,000	7,000-30,000
Appropriateness for Envisioned Range of Uses	To be discussed		

Note: The multi-use path plan may be set to allow for a range of possibilities, so long as the maximum envisioned frequency is provided for in terms of right-of-way

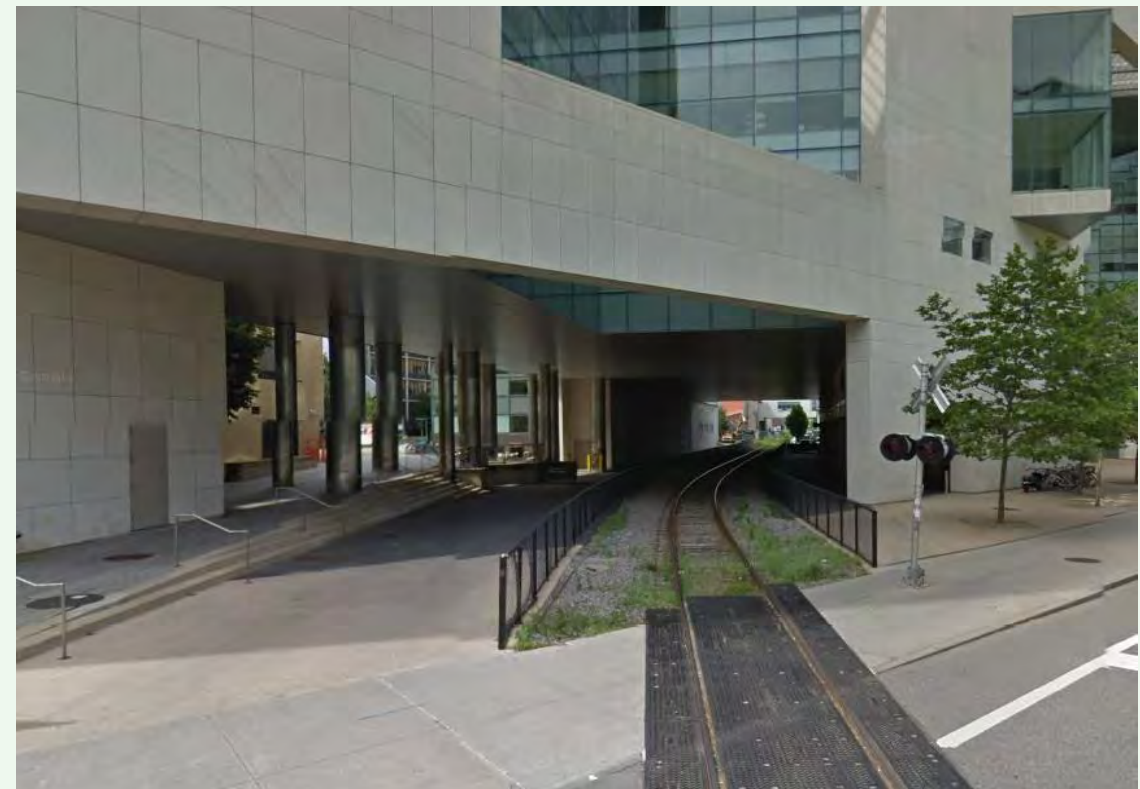
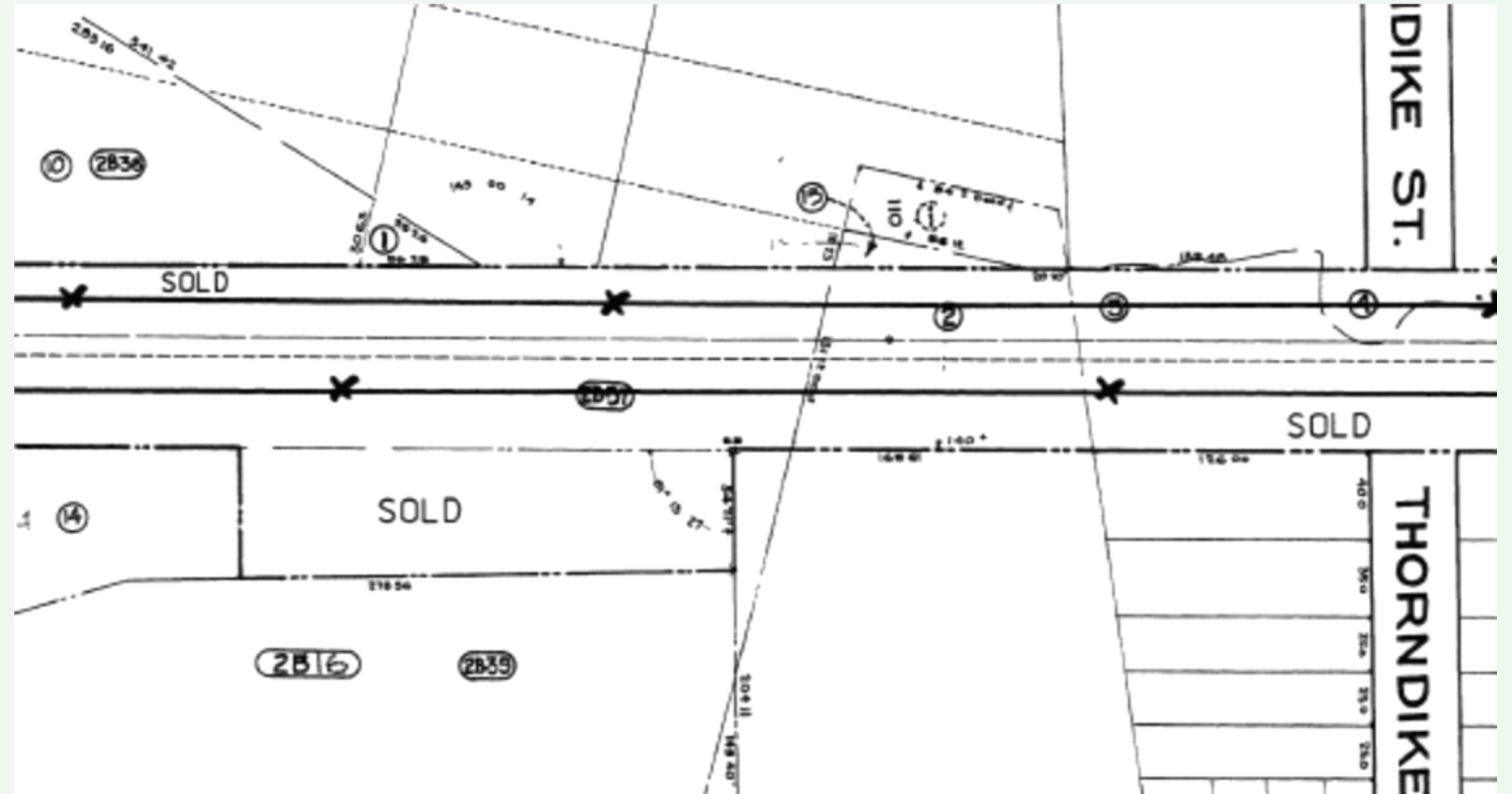


RIGHT-OF-WAY



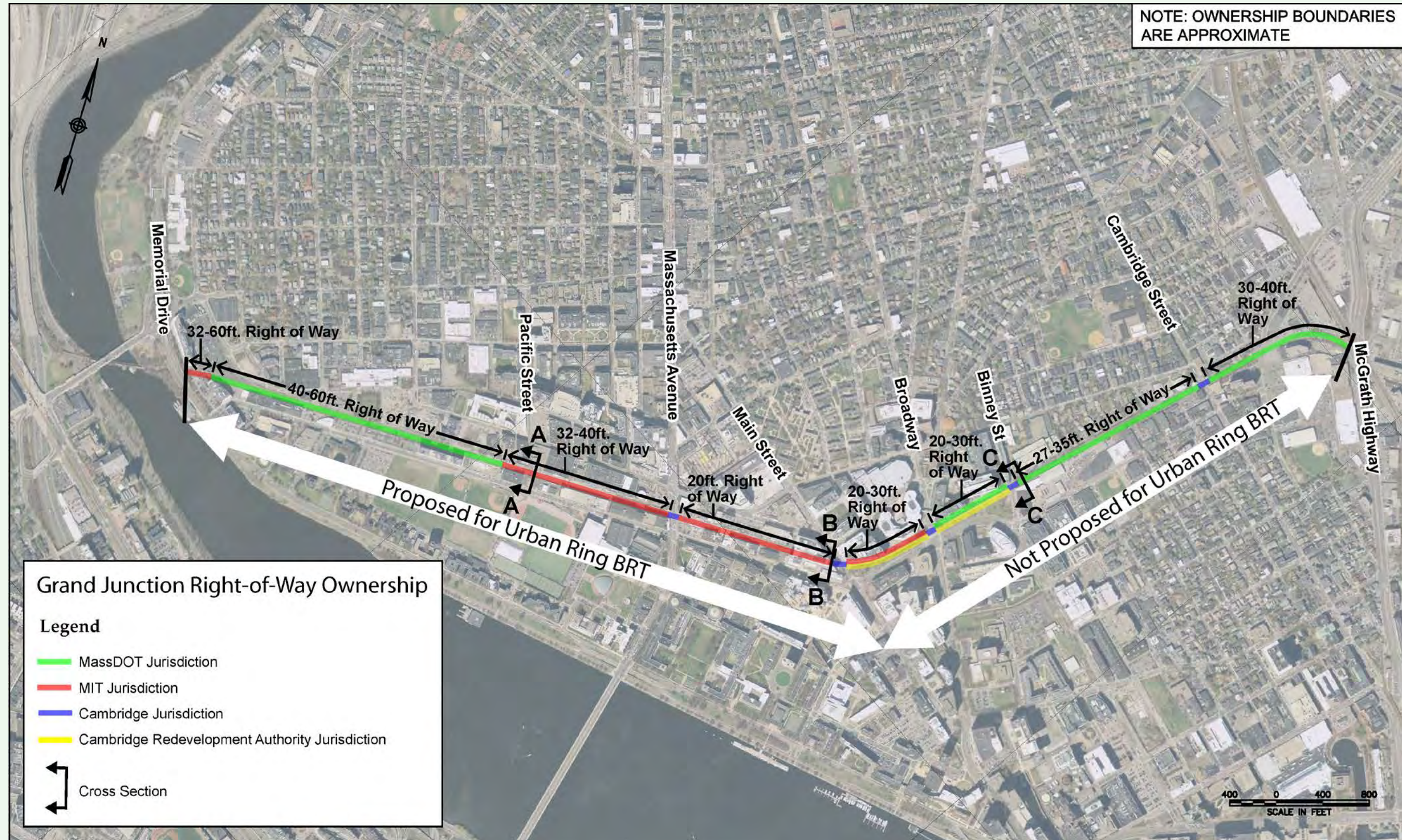
GRAND JUNCTION RIGHT-OF-WAY (ROW)

- *Original* right-of-way provision (19th century) was 82.5 feet
- During the 20th century, *many* strips of land were sold by the owning railroads to raise money.
- The state has acquired or controls what was *not* sold off, which varies considerably in width (20-40 feet generally).
- Much of what was sold off is now used for parking, open space, and even some buildings.





GRAND JUNCTION EXTENT OF STATE CONTROL

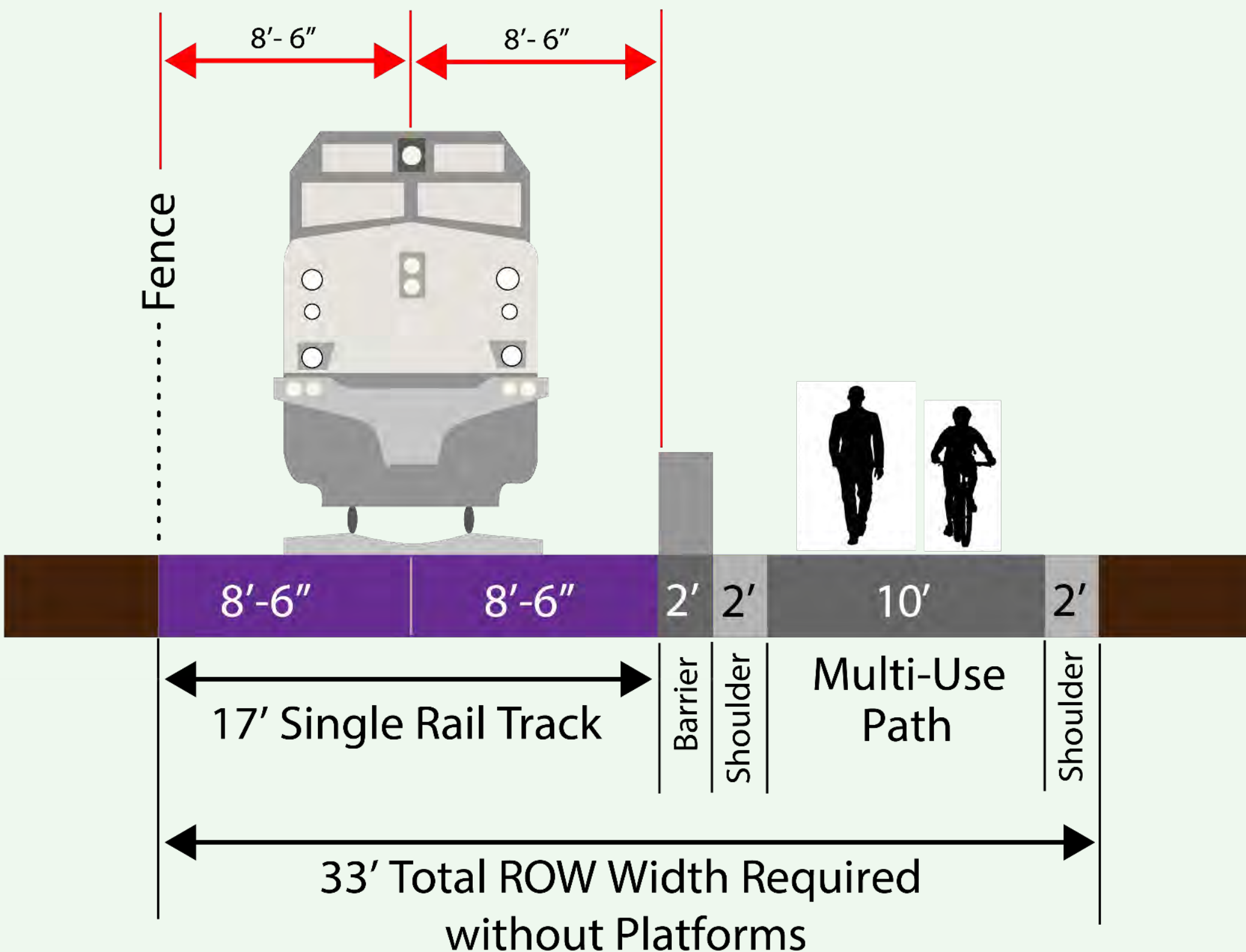


Agreements to use additional ROW are possible in some locations





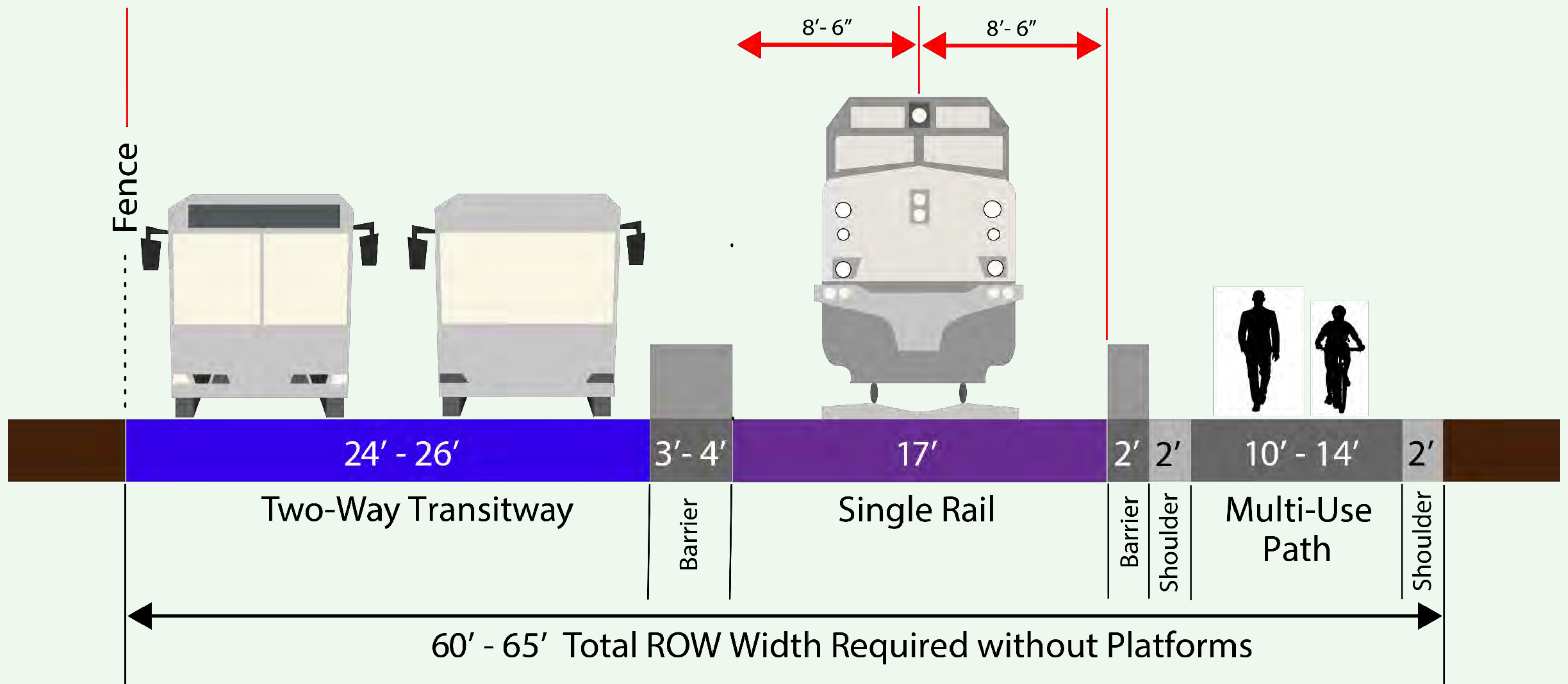
MINIMUM CONFIGURATION (REQUIRED + PLANNED)



- Infrequent, low-speed (10 mph) train movements
- Available ROW not always available
- At narrowest points, path might need an alternate routing, or more ROW would be required
- At severe pinch points, path could narrow to 8' for a total of 31'

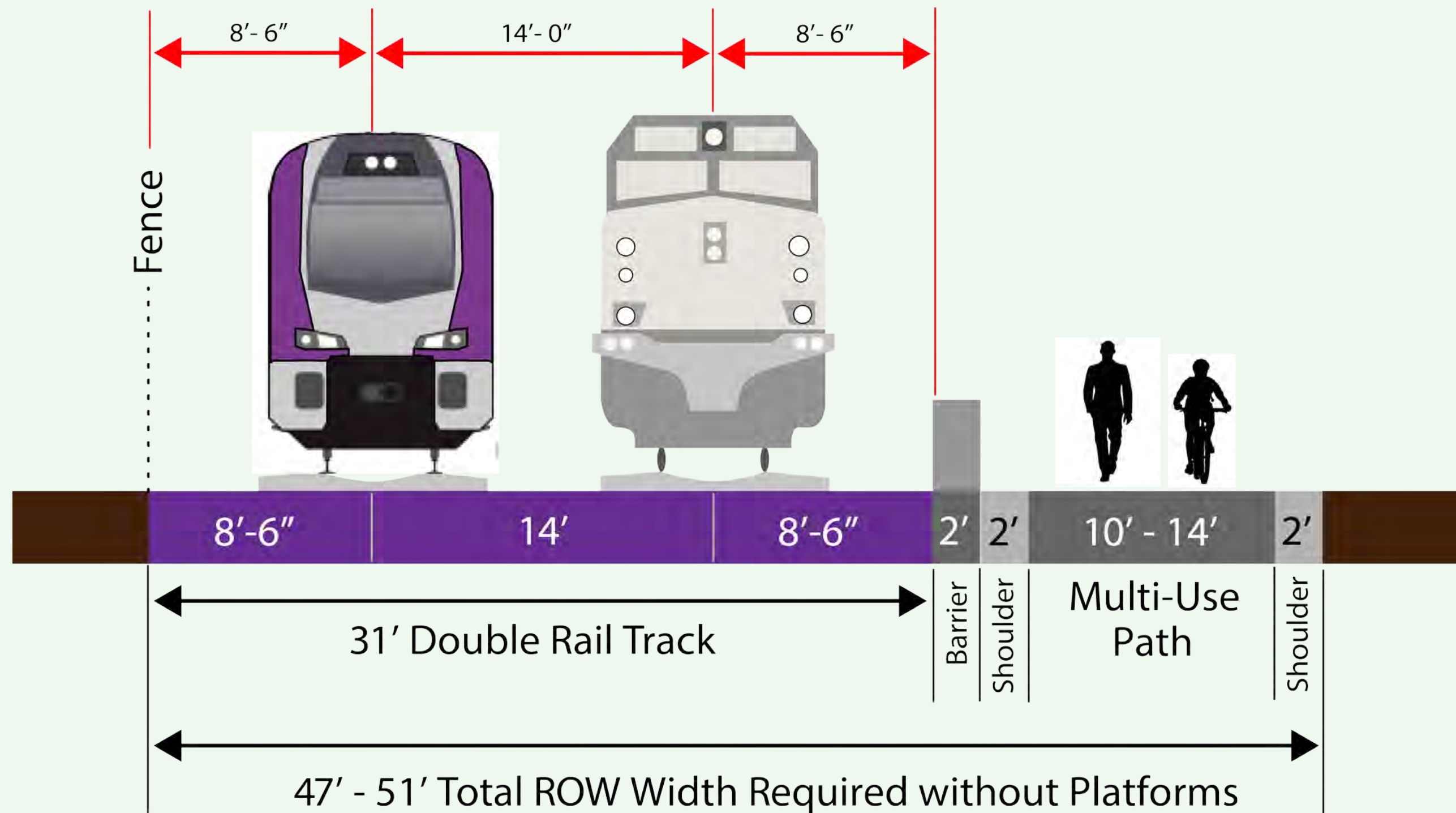


HIGH-FREQUENCY TRANSIT (LIGHT RAIL OR BUS) WOULD REQUIRE THE MOST ROW





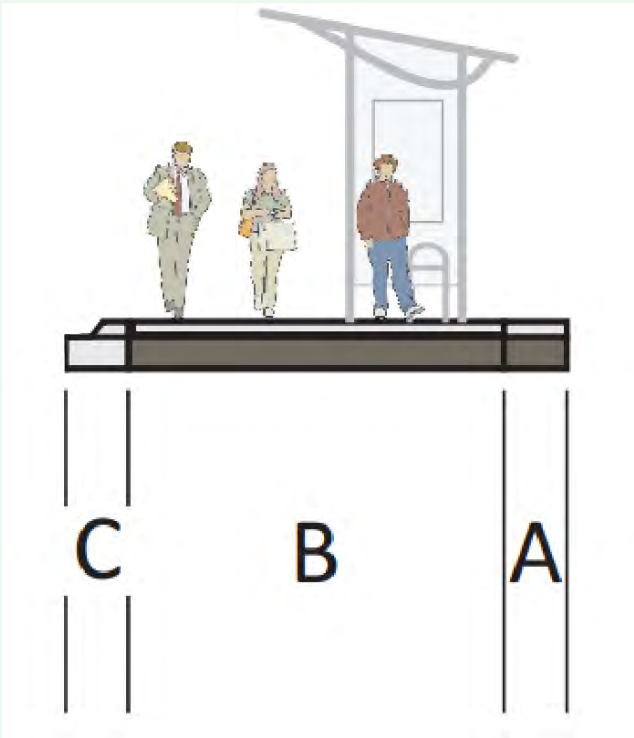
A JOINT USE (DOUBLE TRACK) RAIL CONFIGURATION COULD SUPPORT MODERATE FREQUENCY WITH LESS ROW



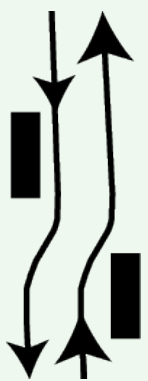

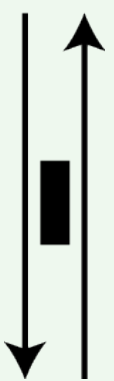
STATION PLATFORMS ADD TO ROW REQUIREMENTS

Minimum Cross Section (side configuration)

Addition for
bidirectional
runningway with
platforms on
each side: 16 to
28 feet



Space-Saving Configurations and net change vs bidirectional side platforms under constrained circumstances

		
Staggered Platform (8'-12')	Single Track (will limit capacity) (15')	Center Platform (4')

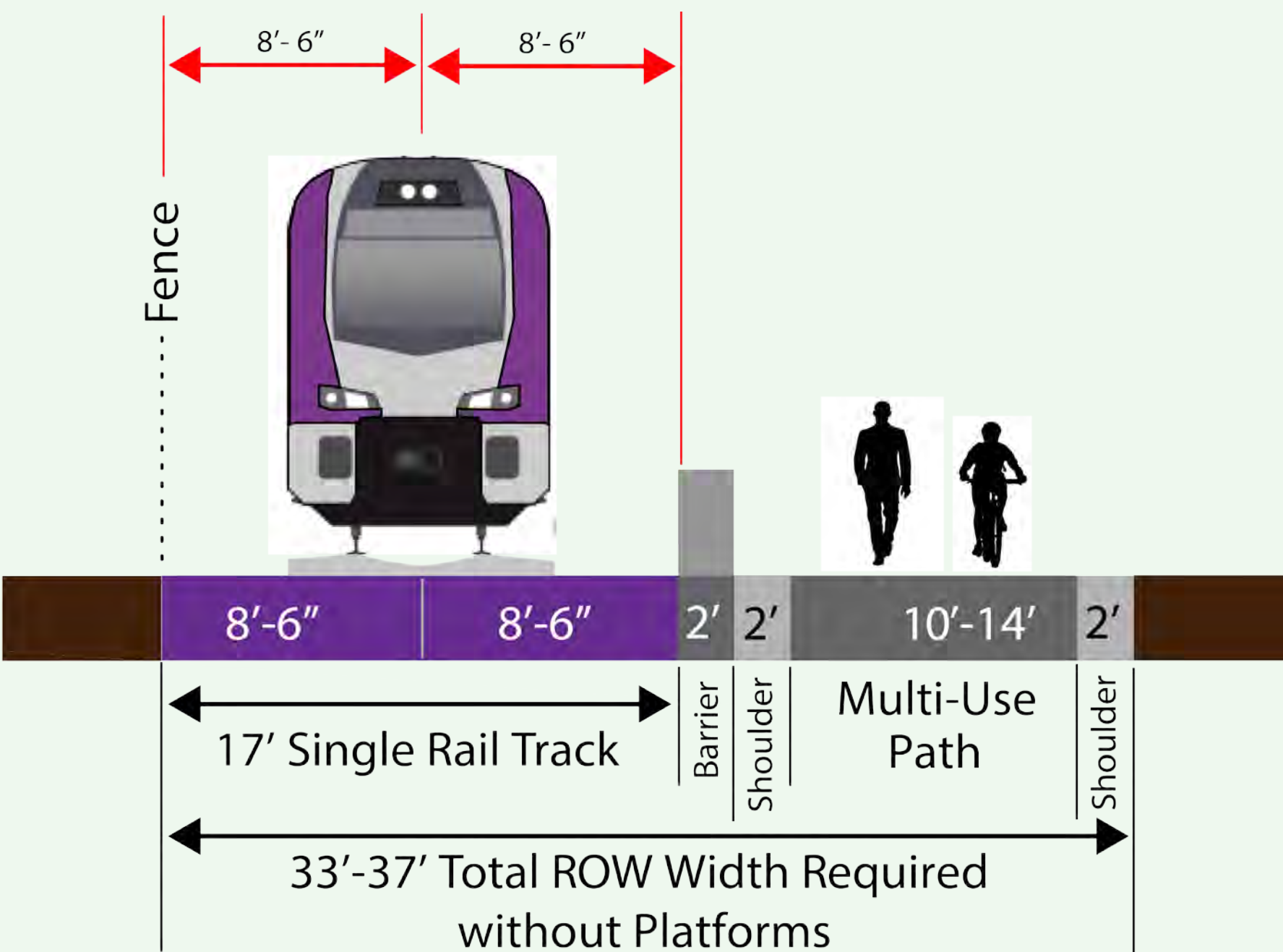
Designation	Description	Dimension (feet)	
		Preferred	Constrained
A	Buffer	Already provided for	
B	Station	14'	8' to 12'
C	Curb and gutter	Already provided for	

An aerial photograph of a city skyline, likely New York City, viewed from across a body of water. The foreground shows several sailboats on the water. The middle ground is filled with a dense cluster of skyscrapers and buildings, including a prominent red-brick building. In the background, a bridge and more distant city structures are visible under a hazy sky.

PROVISION FOR THE FUTURE



POSSIBLE INTERIM STATE: SINGLE- TRACK SHUTTLE



- FRA-compatible DMUs
- Low frequency (20-30 minutes), perhaps peaks only
- Primarily a connection for commuter rail (North and West Stations)
- Track rebuild for higher speeds (30-45 mph)
- Passing siding(s)
- Crossing pre-emption



EXAMPLE SINGLE-TRACK SHUTTLE: OTTAWA'S TRILLIUM LINE 'LRT'



- Non-compliant DMUs
- Initial service every 20 minutes, increased to every 10-15 with track changes
- Maximum speed
- Major campus at the central passing siding
- Single-track rail tunnel precludes full double-tracking – this is an ‘ultimate’ state (and could be for GJ, too)
- 5 miles end-to-end

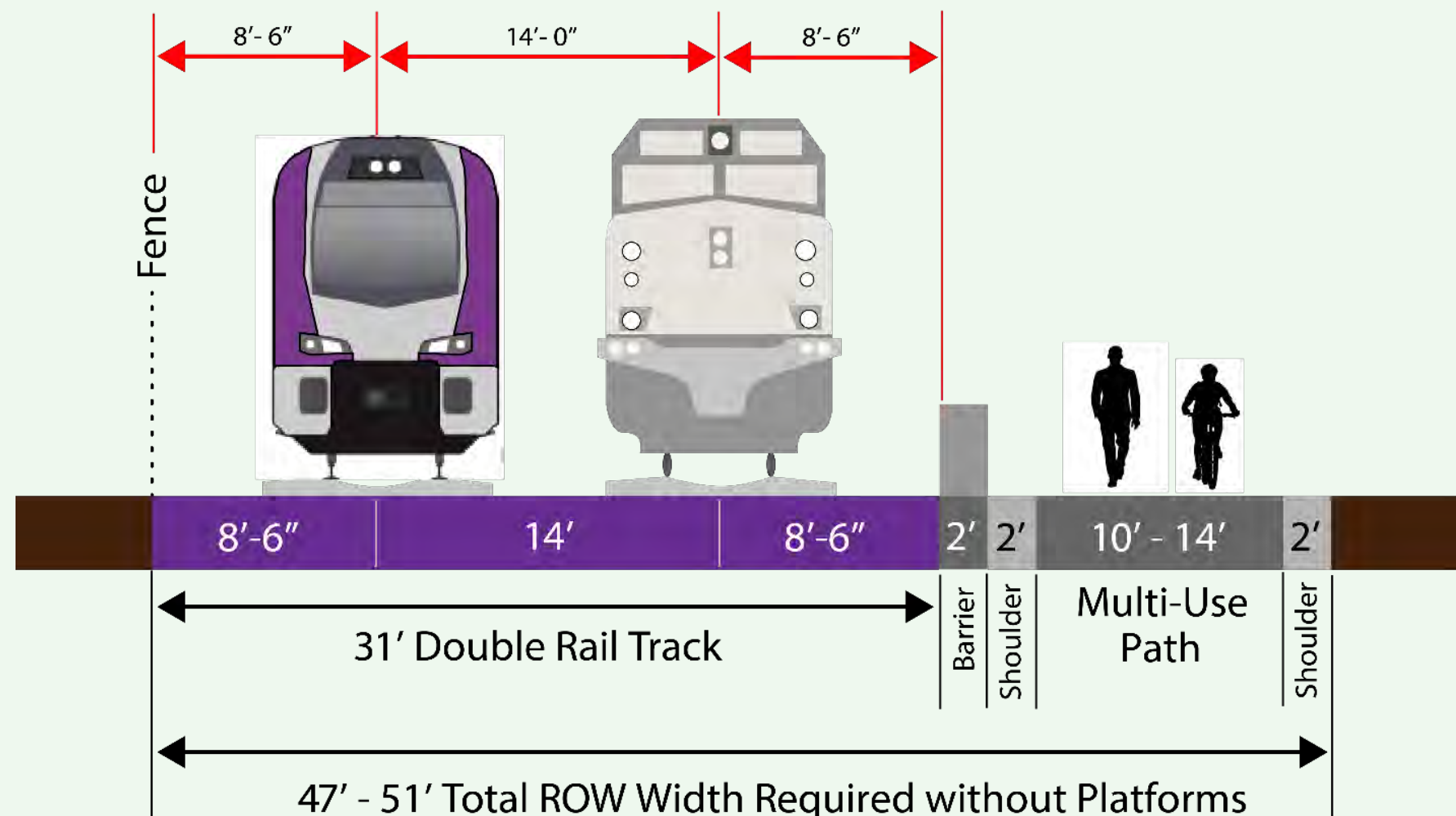


POSSIBLE ULTIMATE STATE: INTERMEDIATE FREQUENCY WITH JOINT USE

- 30-45 mph operating speed
- Crossing pre-emption
- Non-compatible DMUs or 'wireless' light rail with advanced-technology time separation from Amtrak and MBTA movements

OR

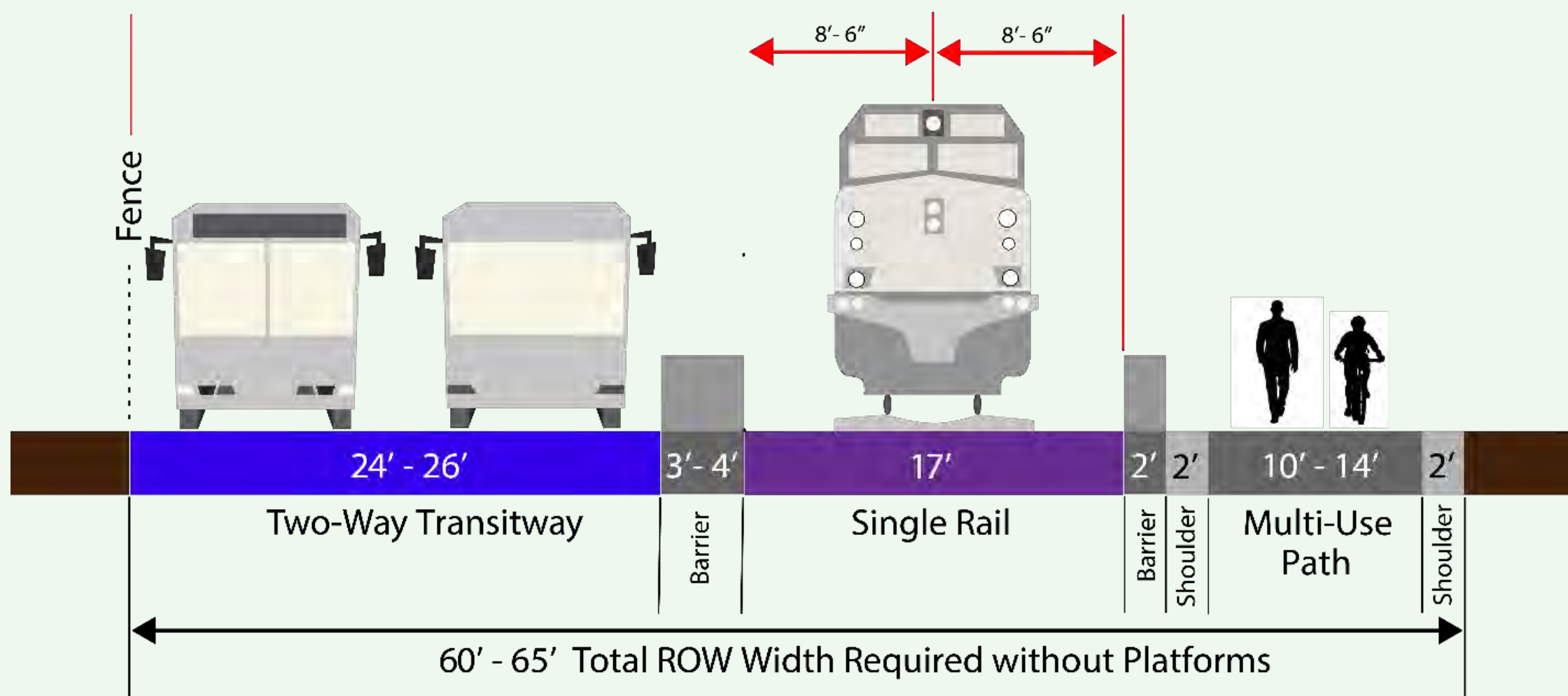
- Higher-frequency service with compatible DMUs





POSSIBLE ULTIMATE STATE: HIGH FREQUENCY, SEPARATED

- Only south of Main St,
- 30-45 mph operating speed
- Full double lanes/tracks designated for transit (with possible short exceptions at 'pinch points')
- Requires balance between traffic and/or transit delays at street crossings



DISCUSSION: WHAT FUTURE TO PROVIDE FOR?

	Single Track Shuttle	Intermediate Frequency Joint Use	High-Frequency Separated
Minimum ROW (with multi-use path)	33-37'	47-51'	60-65'
Supports interim single-track shuttle (West Station – North Station)	Yes	Yes	Yes
Importance of keeping multi-use path as far to one side as possible	Moderate	High	Very High
Possibly Very High Costs to make Links to Sullivan Square and LMA	N/A	Yes	Yes
Supports intermediate transit frequencies (with some associated highway delays)	No	Yes	Yes
Supports rapid transit frequencies (with associated high traffic delays and possible transit delays)	No	No	Yes

An aerial photograph of a city skyline, likely New York City, featuring a river with several sailboats in the foreground. The city is densely packed with buildings of various heights and colors, including a prominent tall, light-colored building in the center. The background shows a hazy horizon with distant hills.

NEXT STEPS

TASK FORCE MEETINGS

Type	Description	Date
Task Force	Draft policy recommendations	November 22, 2016
Public	Summary of work and discussion of draft recommendations	December 13, 2016
Task Force	Present/finalize recommendations	January 17, 2017



NEXT STEPS

- Bus Scenario Modeling
 - Results for the constrained scenario will be available for the November 22nd meeting focused on draft recommendations
 - Schedule for unconstrained scenario TBD
- Next meeting
 - Task Force to discuss information to date and begin to draft short and long term recommendations
 - Plan for the December public meeting

An aerial photograph of a city skyline, likely New York City, featuring a dense cluster of skyscrapers and buildings along a waterfront. The water in the foreground is filled with numerous sailboats. A semi-transparent grey rectangle is overlaid on the lower portion of the image, containing the text "PUBLIC COMMENT".

PUBLIC COMMENT

HOW TO GET INVOLVED

- Website: <http://www.cambridgema.gov/CDD/Projects/Transportation/kendallsquaremobilitytaskforce>
- Contacts:
 - Brian Dacey, President, Cambridge Innovation Center
617-401-2870, dacey@cictr.com
 - Susanne Rasmussen, Director of Environmental & Transportation Planning, City of Cambridge
617-349-4607, srasmussen@cambridgema.gov
 - Tegin Teich Bennett, Transportation Planner, City of Cambridge
617-349-4615, tbennett@cambridgema.gov
- Next Task Force Meeting: November 22nd, Draft Recommendations



THANK YOU!