Massachusetts Bay Transportation Authority

Green Line Transformation (GLT) Core Capacity Program

Overview and status of the Core Capacity Program

April 24, 2025

Informational

Identifying Green Line Customer Needs

Over capacity, not fully accessible, and outdated vehicles

Exceeds the FTA definition for crowding

- 151,000 average weekday riders (Fall 2024)
- B Branch is overcrowded today
- C, D, and E branches will be overcrowded within 10 years

Small and outdated vehicles (Type 7/8)

- Average age: 29 years
- Vehicle useful life: 25 years
- Must be operated in pairs for ADA accessibility

Low customer satisfaction

- 18,000 public comments about the Green Line (May 2018 - March 2025)
  - 1,000+ comments on skipped stops, late trains, and overcrowding

Type 7: Kinki Sharyo – Japan (1986-1988)
Fleet: 103 Vehicles
Age: 35+ Years
Service Life: 30 Years
Length: 74 Feet

Type 8: Ansaldo/Breda – Italy (1999-2007)
Fleet: 86 Vehicles
Age: 17+ Years
Service Life: 25 Years
Length: 74 Feet

Informational

Meeting Green Line Customer Needs

GLT: A modern fleet to provide accessibility and increase capacity

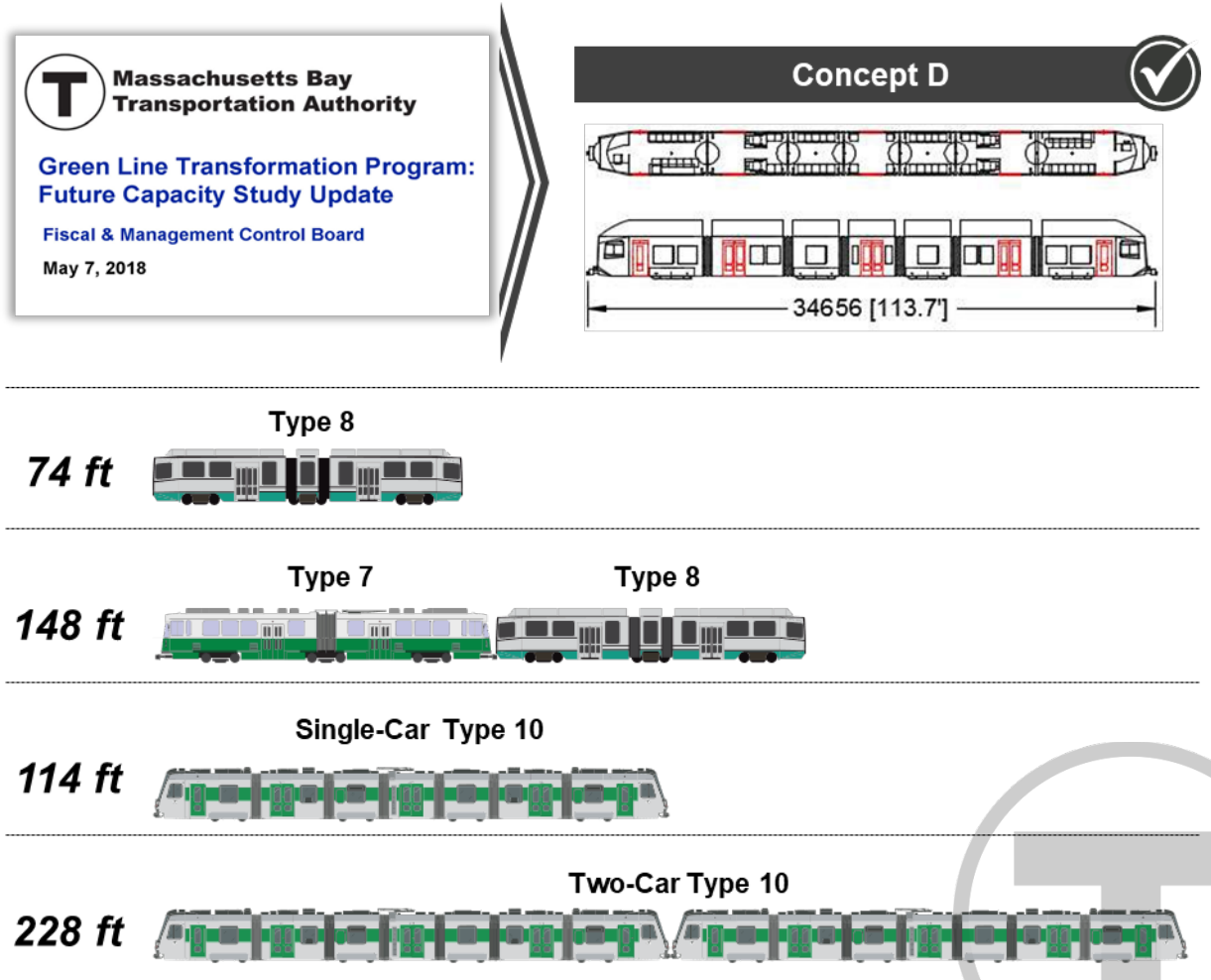
2018 Green Line Transit Capacity Study

- Adopted by the MBTA Board to address existing challenges and future capacity needs
- Considered existing capacity constraints, aging fleet, and accessibility issues
- Simulated operations with multiple combinations of new trains, more frequent service, infrastructure improvements

- Locally Preferred Alternative = “Concept D”
  - Longer cars to provide additional capacity, meet ADA accessibility needs, and replace the aging fleet

Considerations:

- New rail vehicles have 15+ years lead time
- Longer cars require supporting infrastructure upgrades



Informational

GLT Core Capacity Program Supporting Infrastructure

Needed to Begin Type 10 Operations

Yard and Facility Improvements

- ✓ Yard space to store new, longer vehicles
- ✓ Equipment to test & maintain new vehicles

Testing Equipment

- ✓ High speed test track to test trains without interrupting revenue service
- ✓ Simulators to train operators

Signals

- ✓ Upgrades to signals in Central Tunnel

Power

- ✓ Overhead catenary wire needs to be adjusted to work with Type 10s

Needed to Meet Future Capacity Needs

Power

- + More power needed to run double Type 10 trains

Trackwork

- + New crossovers in Central Tunnel

Station Updates

- + Constructing median platforms at end of E Branch

Informational

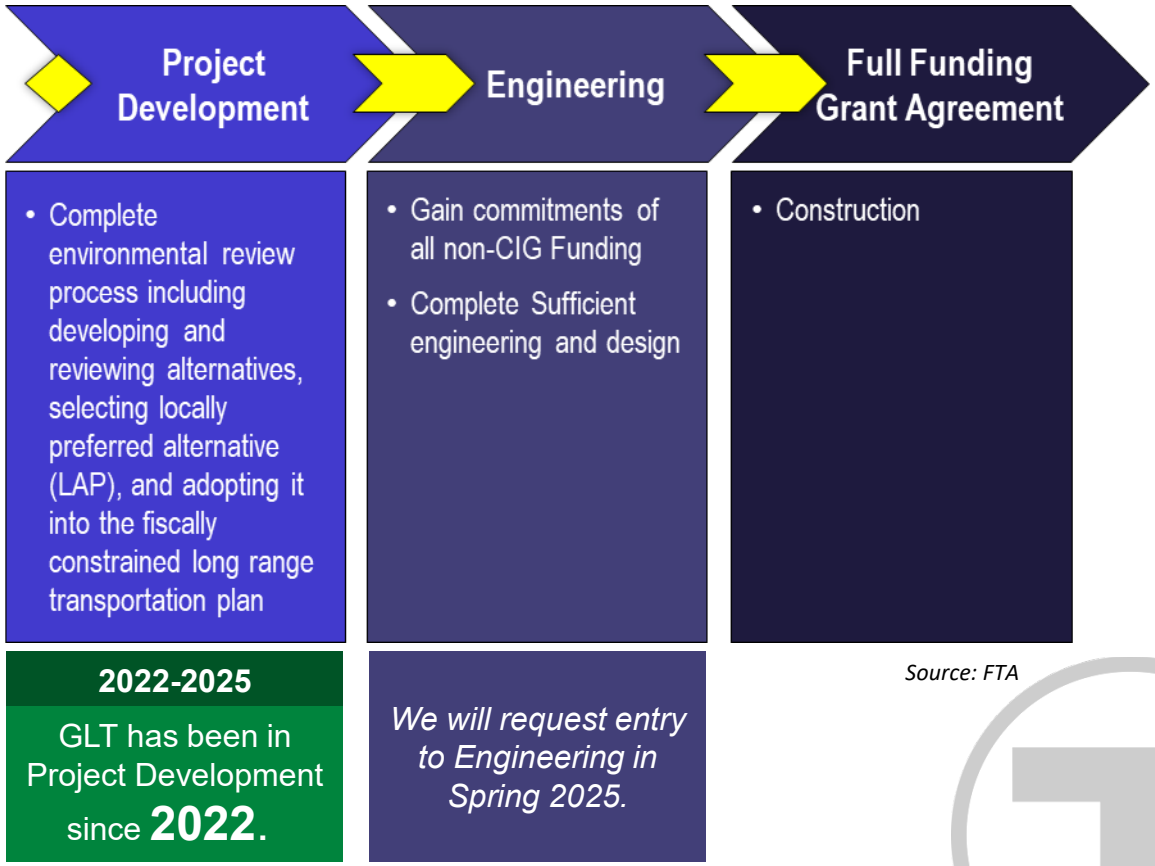
FTA Capital Investment Grants Program | Core Capacity Grant

GLT eligible for FTA funding through Core Capacity Program

Projects may receive Core Capacity grant funding if they meet the following criteria:

- ✓ The corridor must be currently operating at or over capacity, or projected to be in 10 years
- ✓ Projects must involve investments in existing transit corridors
- ✓ Improve capacity along a specific corridor by at least 10%

FTA Core Capacity Process



Source: FTA

Informational

GLT Core Capacity Engagement

The MBTA Board and regional stakeholders are actively engaged in this process

- Past Board Votes:
  - May 7, 2018 Core Capacity Concept D
  - May 7, 2018 Established of GLT
  - June 11, 2018 FY 19 CIP[1]
  - June 17, 2019 FY 20 CIP[1]
  - June 6, 2020 FY 21 CIP[1]
  - June 21, 2021 FY 22 CIP
  - May 26, 2022 FY 23 CIP
  - September 2, 2022 Board Awards T10 Contract
  - June 8, 2023 FY 24 CIP
  - June 11, 2024 FY 25 CIP
- Public Meetings: 48
- Elected Official Briefings: 19
- Environmental Engagement (NEPA/MEPA): 8
- *Destination 2050* endorsement December 19, 2024
- More engagement to come…

[1]MassDOT Board vote

ACTION REQUESTED

GLT Core Capacity Program Locally Preferred Alternative (LPA)

Requirement to Adopt LPA for the Type 10 and infrastructure improvements

Grant Request: $1.9B

Grant Requirement:

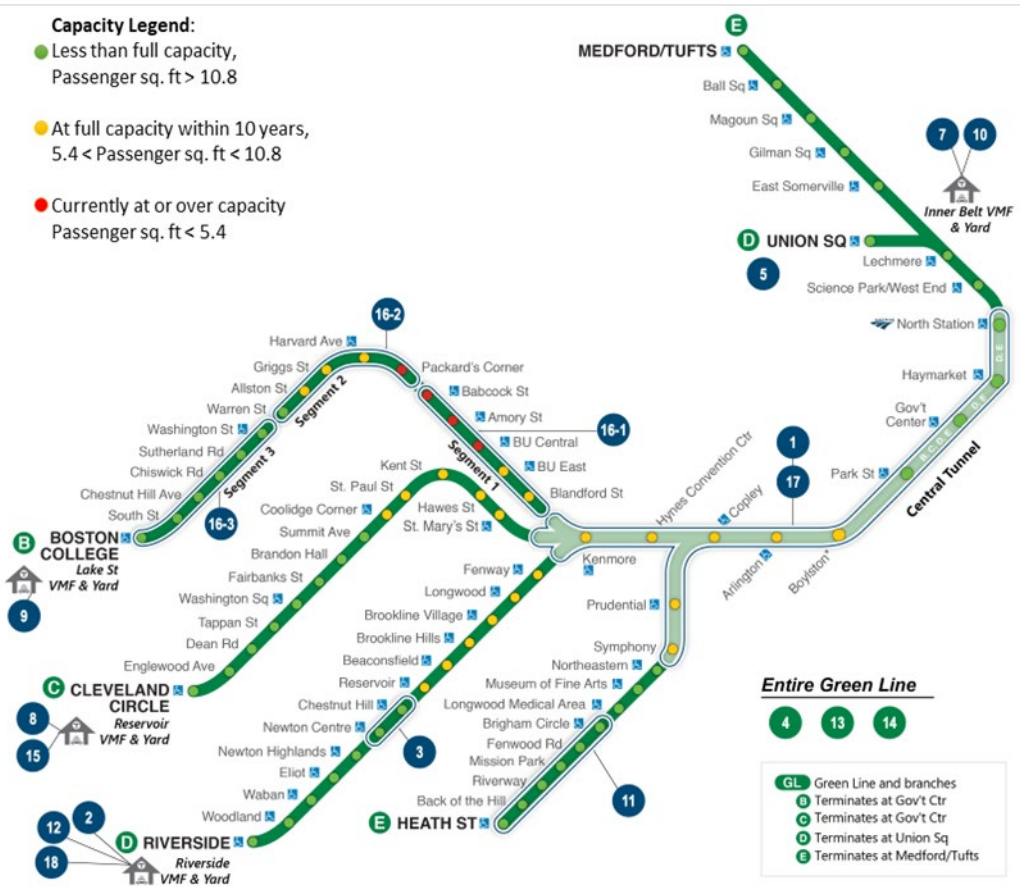
MBTA must adopt a **Locally Preferred Alternative** (LPA) for the Green Line Transformation (GLT) Core Capacity Program before the **next phase begins in May 2025**

Considerations:

- Infrastructure improvements included in GLT Core Capacity Program **are required to operate the Type 10s**
- Past MBTA Board actions have **already approved** the individual element of the program
- $1.9B to replace the aging Green Line fleet and upgrade the system is required **regardless of FTA funding**

Prj#	*Locally Preferred Alternative Projects*
0	*Type 10 Vehicle Procurement (Base Order)*
1	Central Tunnel Package 1 *(Signal Upgrades)*
2	Riverside VMF Package 1 *(Pilot Readiness)*
3	Type 10 High Speed Test Track
4	Overhead Catenary System Relocation
5	Type 10 Simulator Training Facility Upgrade
6	*Project Removed (VTF)*
7	Inner Belt VMF
8	Reservoir Lower Yard & Non-Revenue Track
9	Lake Street Yard
10	Inner Belt Yard
11	E Branch Accessibility & Infrastructure Improvements
12	Riverside Yard
13	Traction Power Upgrades *(D Branch)*
14	Type 10 Vehicles *(58 option cars)*
15	Reservoir VMF
16	B Branch Accessibility & Infrastructure Improvements
17	Central Tunnel Package 2
18	Riverside VMF Package 2

Project Locations



Informational

GLT Core Capacity Program Budget and Federal Contribution

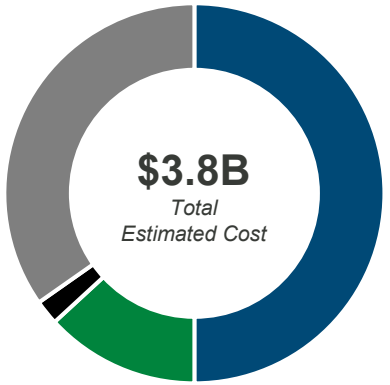
The MBTA is seeking 50% of total program costs from FTA's CIG funds

CIP	Project	MBTA Commitment (CIP)*	Total Estimated Costs*
P0591	Central Tunnel Package 1 & 2	$ 69.3	$ 910.4
P1010	Riverside VMF	$ 49.4	$ 105.7
P0921	Type 10 Dedicated High Speed Test Track	$ 11.1	$ 36.5
P1102	Overhead Catenary System Relocation	$ 18.7	$ 30.3
P1105	Type 10 Simulator Training Facility Upgrade	$ 9.3	$ 10.2
P1011	Inner Belt VMF	$ 12.4	$ 40.4
P1103	Reservoir Lower Yard & Non-Revenue Track	$ 30.5	$ 123.1
P1101	Lake Street Yard	$ 29.3	$ 112.7
P1336	Inner Belt Yard	$ -	$ 140.0
P0923	E Branch Accessibility & Infrastructure Improvements	$ 53.2	$ 259.6
P1334	Riverside Yard	$ 4.0	$ 234.9
P0922	Traction Power Upgrades	$ 10.0	$ 290.6
P1337	Type 10 Vehicles (58 option Cars)	$ -	$ 519.4
P1338	Reservoir VMF	$ -	$ 19.4
P0924	B Branch Accessibility & Infrastructure Improvements	$ 200.2	$ 693.3
P0920	Green Line VMF Systematic Planning (Phase 1 & 2 Reports)	$ 10.0	$ -
	Finance Charges	$ -	$ 274.2
	Total	**$ 507.3**	**$ 3,800.6**

*In Millions

The MBTA has committed **$507.3M** in funds through the FY25-29 CIP process

- Plus **$81.0M** in state funds through the Commonwealth Federal Matching and Debt Reduction Act
- Future MBTA funds need to be committed in future CIPs



- **Potential CIG Contribution ($1.9B)**
- **State Matching Funds ($81.0M)**
- **Current MBTA Commitment ($507.3M)**
- **Future MBTA Funding Required ($1.3B)**

ACTION REQUESTED

Board Action Requested

Adopt GLT Core Capacity LPA and Affirm CIP Funding

Today we are requesting that the Board

- Formally adopt the GLT Core Capacity Program as the Locally Preferred Alternative, and
- Affirm the Capital Investment Program's commitment to addressing the needs of the MBTA's Green Line and its riders.

With this action, the Board authorizes the MBTA to carry out the GLT Core Capacity Program.

Appendix

Green Line at a Glance

Challenges facing the Green Line

Accessibility Needs

Access is Inconsistent, Stations and vehicles cannot provide accessible boarding experience and needs to be improved

- 25 Stations are currently inaccessible

Aging Vehicles and Infrastructure

Travel time increases from flagged track conditions and operational constraints

- Average age of vehicles: 29 years
- Industry standard useful life: 25 years

Passenger Overcrowding

Returning ridership is expected to face crowding during peak periods, with demand to grow

- B Branch is overcrowded and C, D, & E Branches will be within 10 years

1897 FIRST SUBWAY IN AMERICA

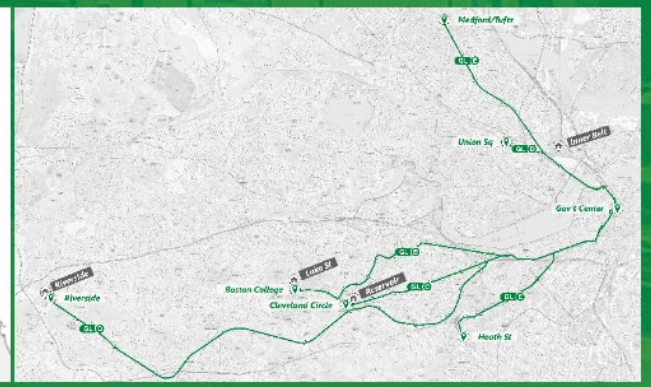
70	45	151,000	26.7 Miles
Green Line Stations	ADA Compliant Stations	Weekday Riders in Fall 2024	Subway & Surface Running Tracks
2018: 66 ↑	2018: 32 Stations ↑	2018: 160,000 ↓	2018: 23 Miles ↑

213 Light Rail Vehicles *Type 7, 8, 9s*

4 Vehicle Maintenance Facilities *Riverside, Reservoir, Lake St, Inner Belt*

The Longest Network in the MBTA System

Serving Boston, Brookline, Newton, Cambridge, Somerville, and Medford



Green Line Transformation Core Capacity Project

#	Project		CIP #
●	Type 10 Vehicle Procurement *(Base Order)*		P0369
1	Central Tunnel Package 1 *(Signal Upgrades)*		P0591
2	Riverside VMF Package 1 *(Pilot Readiness)*		P1010
3	Type 10 Dedicated High Speed Test Track		P0921
4	Overhead Catenary System Relocation	GL	P1102
5	Type 10 Simulator Training Facility Upgrade		P1105
6	*Project Removed (VTF)*		N/A
7	Inner Belt VMF		P1011
8	Reservoir Lower Yard & Non-Revenue Track		P1103
9	Lake Street Yard		P1101
10	Inner Belt Yard		P1336
11	E Branch Accessibility & Infrastructure Improvements		P0923
12	Riverside Yard		P1334
13	Traction Power Upgrades *(D Branch)*	GL	P0922
14	Type 10 Vehicles *(58 option cars)*	GL	P1337
15	Reservoir VMF		P1338
16-1	B Branch Accessibility & Infrastructure Improvements *(Segment 1)*		P0924
16-2	B Branch Accessibility & Infrastructure Improvements *(Segment 2)*		P0924
16-3	B Branch Accessibility & Infrastructure Improvements *(Segment 3)*		P0924
17	Central Tunnel Package 2		P0591
18	Riverside VMF Package 2		P1010

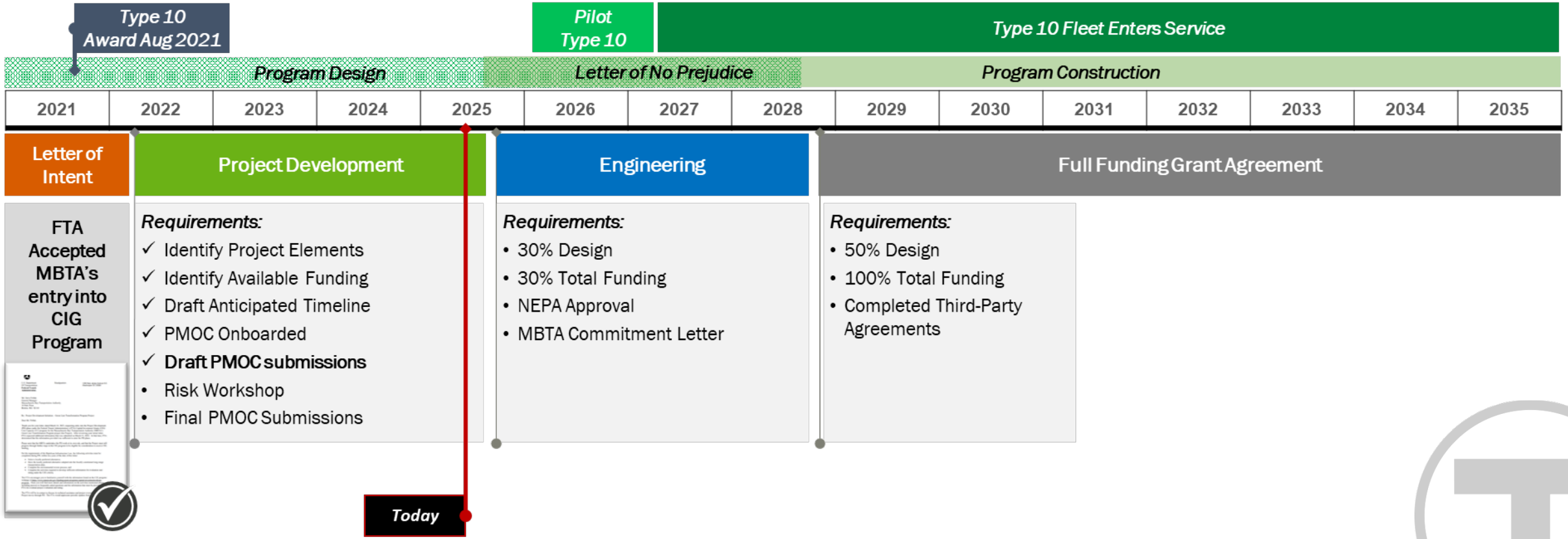
GLT Core Capacity Projects

Capacity Legend:
- Less than full capacity, Passenger sq. ft > 10.8
- At full capacity within 10 years, 5.4 < Passenger sq. ft < 10.8
- Currently at or over capacity Passenger sq. ft < 5.4

Type 10 Order:
102 + 58 Vehicles

GLT Core Capacity Program Timeline

MBTA is on schedule to meet the FTA grant requirements in time for the Type 10 and the required Infrastructure improvements



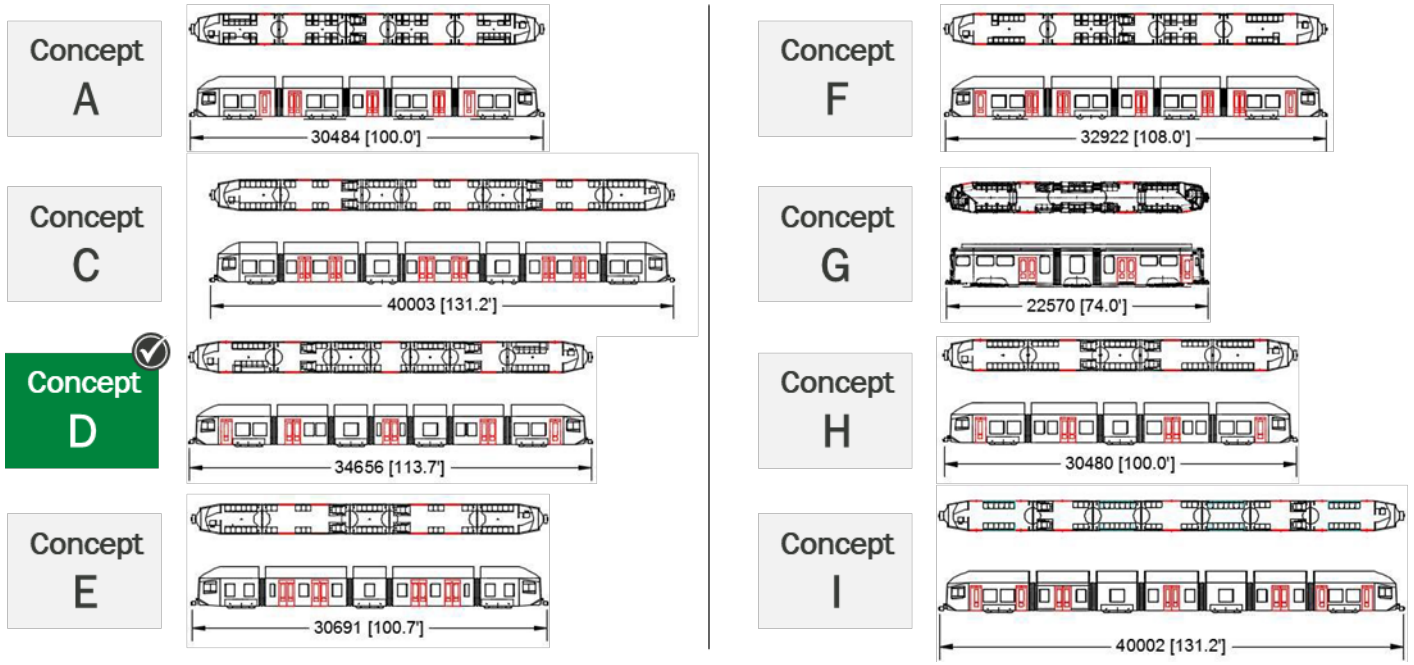
2018: Future Capacity Study – Selecting Concept D for Type 10

The decision-making process for modernizing the Green Line fleet

Multiple operational simulations were run to identify the best combination of concept vehicles and infrastructure needs and Concept D was recommended

- ✓ Single car 113.7 feet long, double car 225 feet long
- ✓ 7 sections with 4 powered trucks
- ✓ Fully accessible 100% low floor, no stairs
- ✓ Same passenger capacity as a two car type 8/9 train
- ✓ 5 door openings per side
- ✓ Full width cab at each end

Green Line Concept Vehicle Options



Evaluation Criteria

☐ Infrastructure Changes	☐ Fleet Operating Costs	☐ Procurement Risk
☐ Future Capacity	☐ Predicted Reliability	☐ Technical Risk
☐ Dwell Time Impacts	☐ Operating Impact on Infrastructure	☐ Industry Standards
☐ Fleet Maintenance Costs	☐ Fleet Procurement Costs	☐ Interoperability

2018: Future Capacity Study - Evaluating Infrastructure for Type 10

All infrastructure constraints that impact vehicle design and capacity were identified

Bridges & Structures

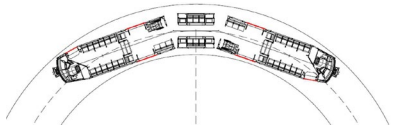
Longer and heavier cars with different axle spacing will load bridges differently than existing cars

Lechmere Viaduct

- Modernization required because the condition of the bridge

Clinton Path Underpass

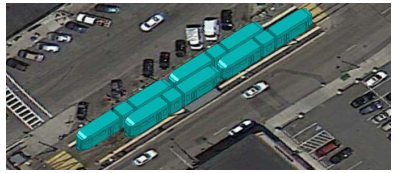
- Pedestrian Underpass near Reservoir needs Minor upgrades will be needed to support a longer vehicle



Restrictive Curves

Tight Curves restrict vehicle design and operations

- Reservoir Yard: West Wye Curve 97 at 45ft
- Lake St Yard Curve 16 at 45ft, Inner Loop at 45ft, Curve 13 at 46ft
- Park St Loop at 47ft is needed to maintain operational flexibility
- Government Center Brattle Loop at 49ft



Station & Platform Lengths

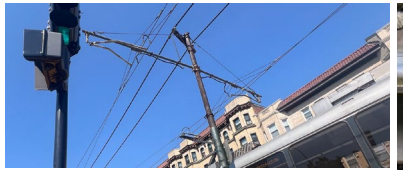
225 feet is optimally required platform length

- 34 Platforms are Under 225 Feet
  - D & E Branches: 3 Platforms require work to run longer trains
  - B & C Branches: 27 Platforms must be extended to 225 feet

Vehicle Maintenance Facilities & Storage

Riverside, Reservoir, Lake Street & Inner Belt Upgrades

- Shop equipment such as lifts, and roof access mezzanines are positioned to maintain the existing fleets of 75-foot cars with three trucks
- Longer vehicles with more trucks will require new lifts and new storage strategies



Power & Signals

Legacy Signals limit vehicle operations

- $350M+ Green Line signals modernization program
- Green Line Train Protection (GLTP)

Running more trains puts more stress on the distribution network

- Power Capacity analysis is planned to define what cable and wiring upgrades are needed now and for the future

Track State of Good Repair

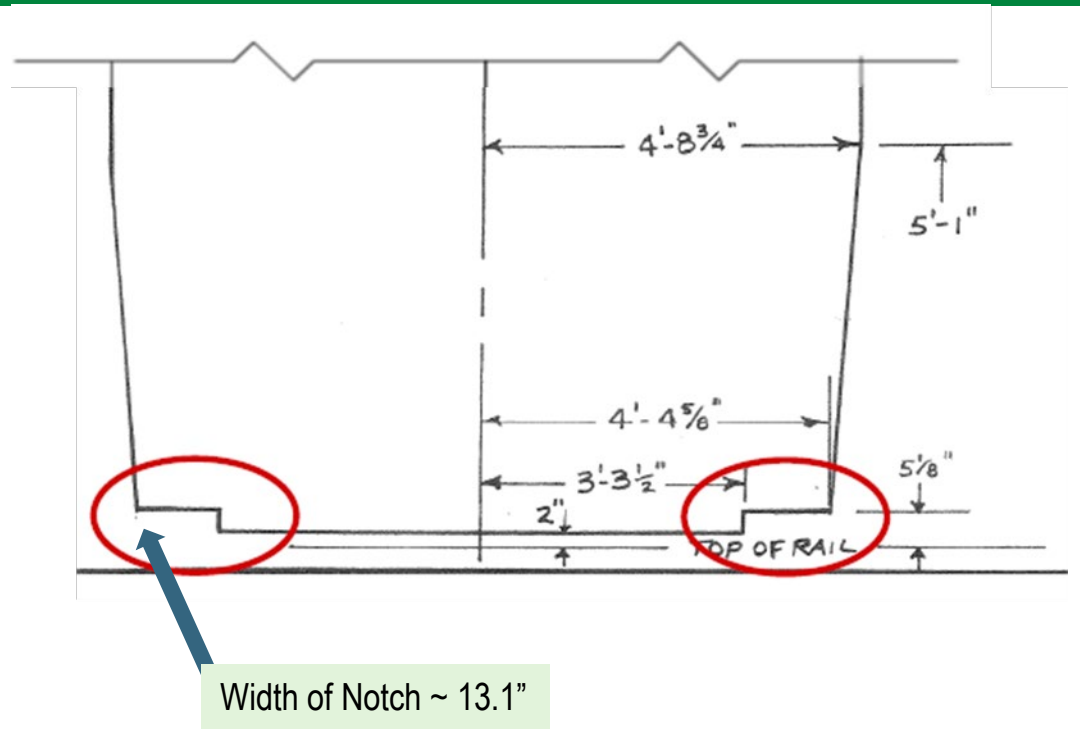
Track conditions can limit operations of a fully accessible vehicle

- Continue investments of $150M+ currently dedicated to SGR of Green line track
- Additional track upgrades are anticipated to be need to return all Green Line track to good condition

Dynamic Envelope, Undercar Clearance, and the 160 Notch

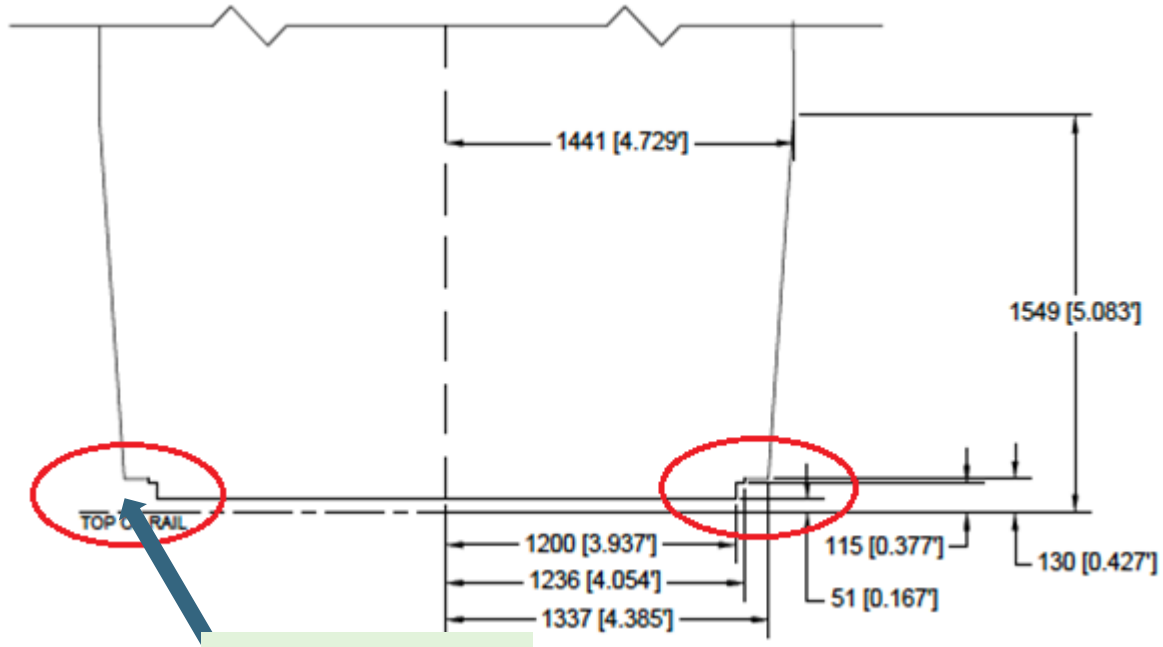
Type 7 vs. Type 10

Dynamic Envelope for Type 7 Undercar/Truck Clearance



Width of Notch ~ 13.1”

Dynamic Envelope for Type 10 Undercar/Truck Clearance

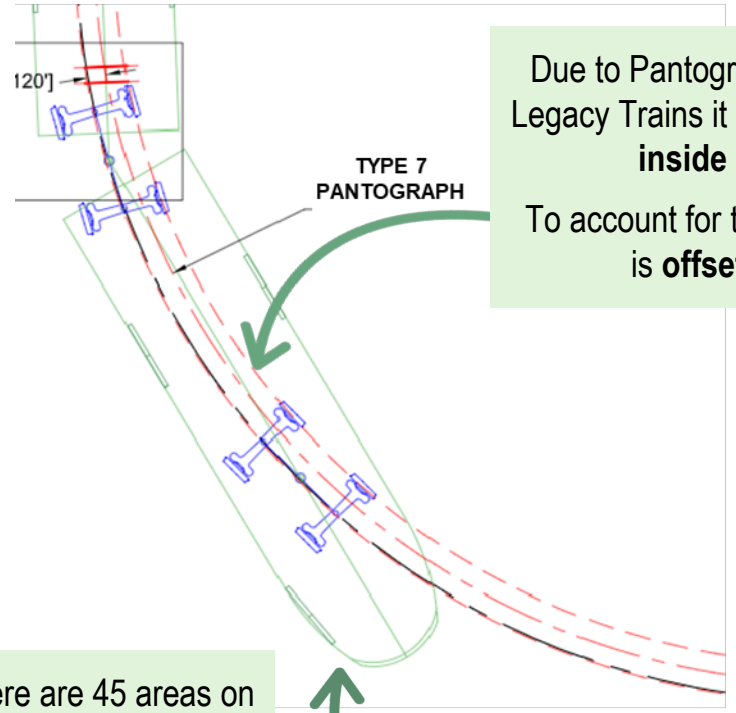


Width of Notch ~ 5.4”

Due to the 100% low floor design of the type 10 train the size of the “160 Notch” had to be reduced resulting in a larger dynamic envelope for the trucks
Number of locations affecting operations: 159

Dynamic Envelope and Overhead Catenary Positioning

Type 7 vs. Type 10



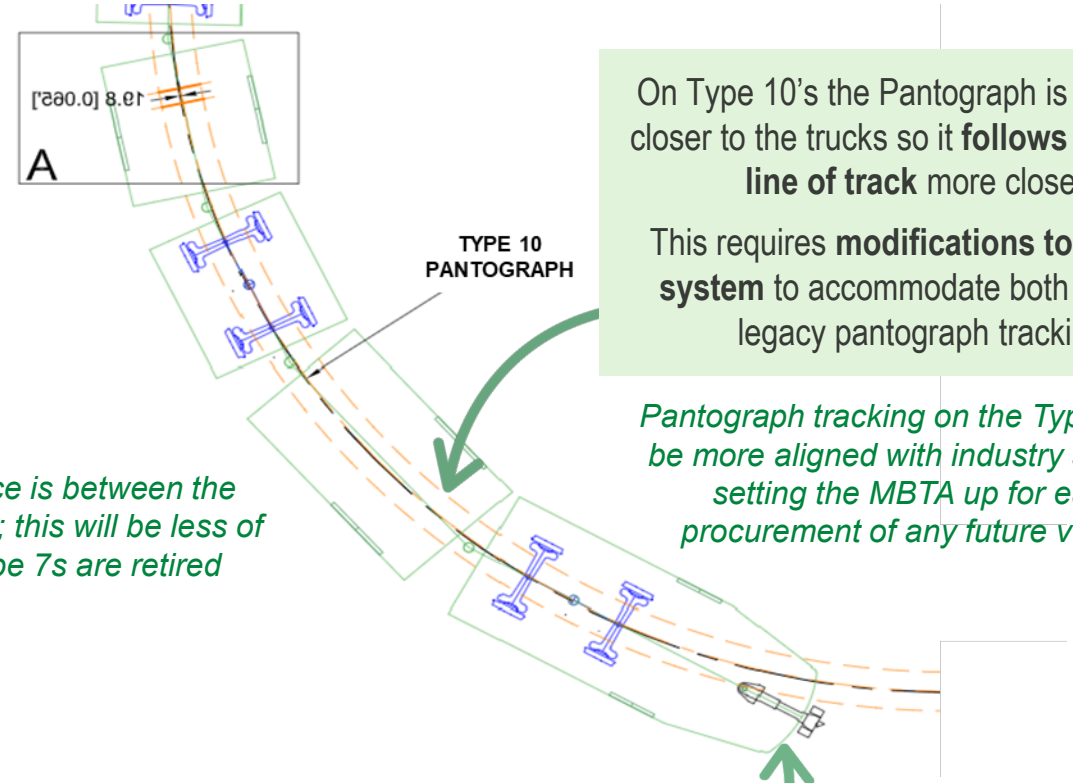
Due to Pantograph Positioning on Legacy Trains it **tracks towards the inside of curves.**

To account for this the contact wire is **offset** on curves

There are 45 areas on the Green Line where OCS needs to be relocated for the Type 10

Longer Section lengths cause the train to **overhang the track on both the inside and outside of curves.** This increases the clear area needed for the **Dynamic Envelope**

The largest difference is between the Type 7s and Type 10s; this will be less of a problem once Type 7s are retired



On Type 10's the Pantograph is positioned closer to the trucks so it **follows the center line of track** more closely.

This requires **modifications to the OCS system** to accommodate both new and legacy pantograph tracking.

Pantograph tracking on the Type 10s will be more aligned with industry standard, setting the MBTA up for easier procurement of any future vehicles

Type 10's shorter section lengths cause the train to **overhang less,** Shrinking the **Dynamic Envelope** on curves