Massachusetts Bay Transportation Authority

Regional Rail Transformation Update: EMU Pilot and Phase 1 Planning Update

Fiscal and Management Control Board

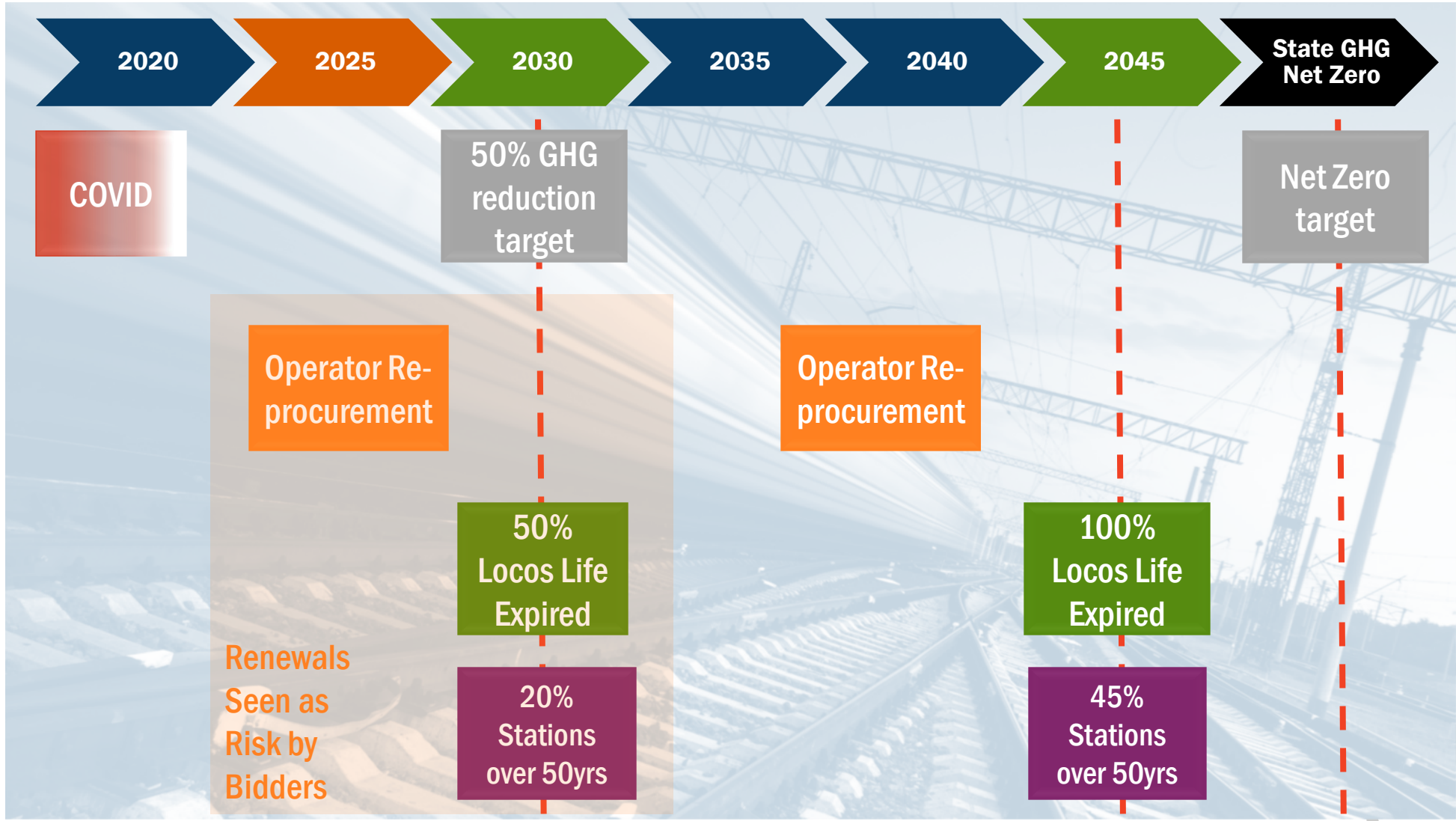
April 12, 2021

Alistair Sawers

Agenda

- Current plans to meet objectives
  - Deadline driven approach
  - Resulting Scope
  - Previous Illustrative Schedule
- First Steps
  - Service changes and planning
  - Boston-Providence EMU Pilot
- Phase 1 Electrification Planning
  - Funded versus unfunded design scope
  - Potential rolling approach

Deadline-driven Approach



Transformation Program Level Scope

Operations

- Service Planning
  - Journey time improvements
  - Easier connections
  - Schedule integration with bus
- Fares
  - Regional & Urban rail customer targeted products
- Frictionless transfers
  - Fare integration with first/last mile
  - Single media – AFC 2.0
- Improved Customer information
- Key Performance data gathering
  - Monitor delivery of goals
- Rolling Stock
  - Continued enhanced cleaning
  - Improved on board experience & facilities with new equipment

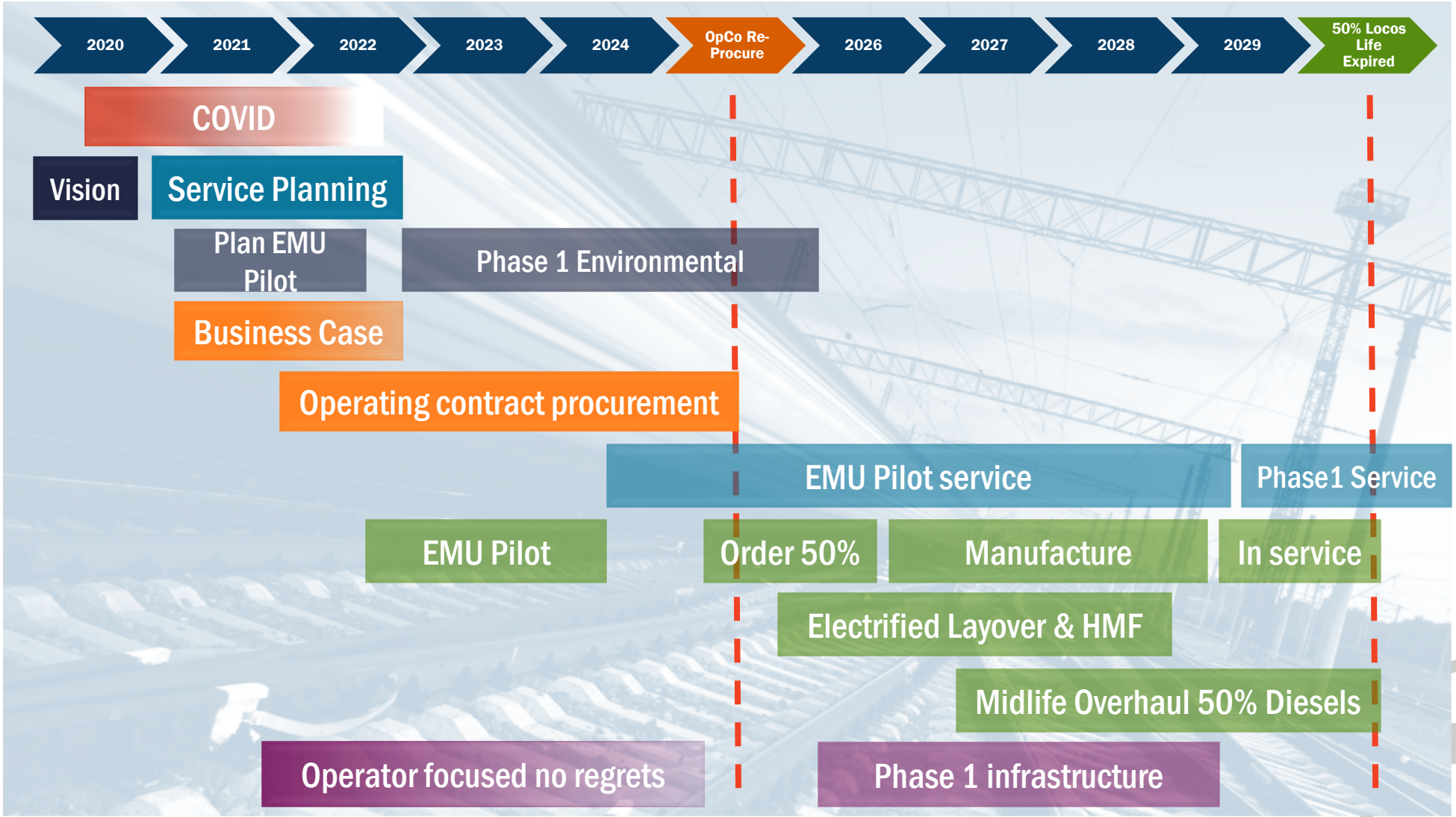
Infrastructure

- Stations
  - Bus stops & drop off facilities
  - Pedestrian & bike access, wayfinding
  - High level platforms & accessibility improvements
  - State of good repair & brightening
  - Parking – Auto & bicycle
- Transit Oriented Development
  - Land
  - Mitigations
- Network improvements
  - Turn tracks
  - Drawbridge replacement
  - Double & Triple Track
  - Signal improvements
  - Grade Crossing improvements/new grade separation
- Electrification…

Phase One Electrification Scope

	Providence Line	Fairmount Line	EJ line to Lynn/Beverly
Traction Power	Final Attleboro section in procurement	New Catenary required	New Catenary required
Power feed	Additional transformer feed	Use NEC power feed	New connections required
Rolling Stock	EMU Pilot	Incremental EMU Pilot option order	EMU or BEMU
Maintenance & Layover	Temporary LMF Future HMF	Use Providence line facilities	New HMF and layover
Height Clearance	1-2 Bridges identified as potential conflicts	Bridges	Tunnel, Bridges
Station Upgrades	Minor platform modifications, grounding	Optional 2 high level platforms, grounding	BEMU may require High level platforms
Track & signal constraints			Single track at Salem, grade crossings, North station approach, drawbridges

Previous Illustrative Schedule



Note: Pale box signifies not programed in CIP

First Steps

Current Work

Current Service Planning

- Transformation is a service-based program
  - First steps were in fall schedule
    - Test of urban rail service on EJ Line
    - Increased frequency N Station-Beverly to 30mins all day by spreading peak trains
    - Newburyport and Rockport services augmented by trains terminating at Beverly Depot
  - New Spring Regional Rail Schedule
    - Pilots “Clock face” service on 9 out of 15 lines/sections
    - Eg Lynn 04 and 34 mins past hour inbound from 6:34am to 4:34pm
  - Service changes highlight bottlenecks in infrastructure (which impact all types of train)

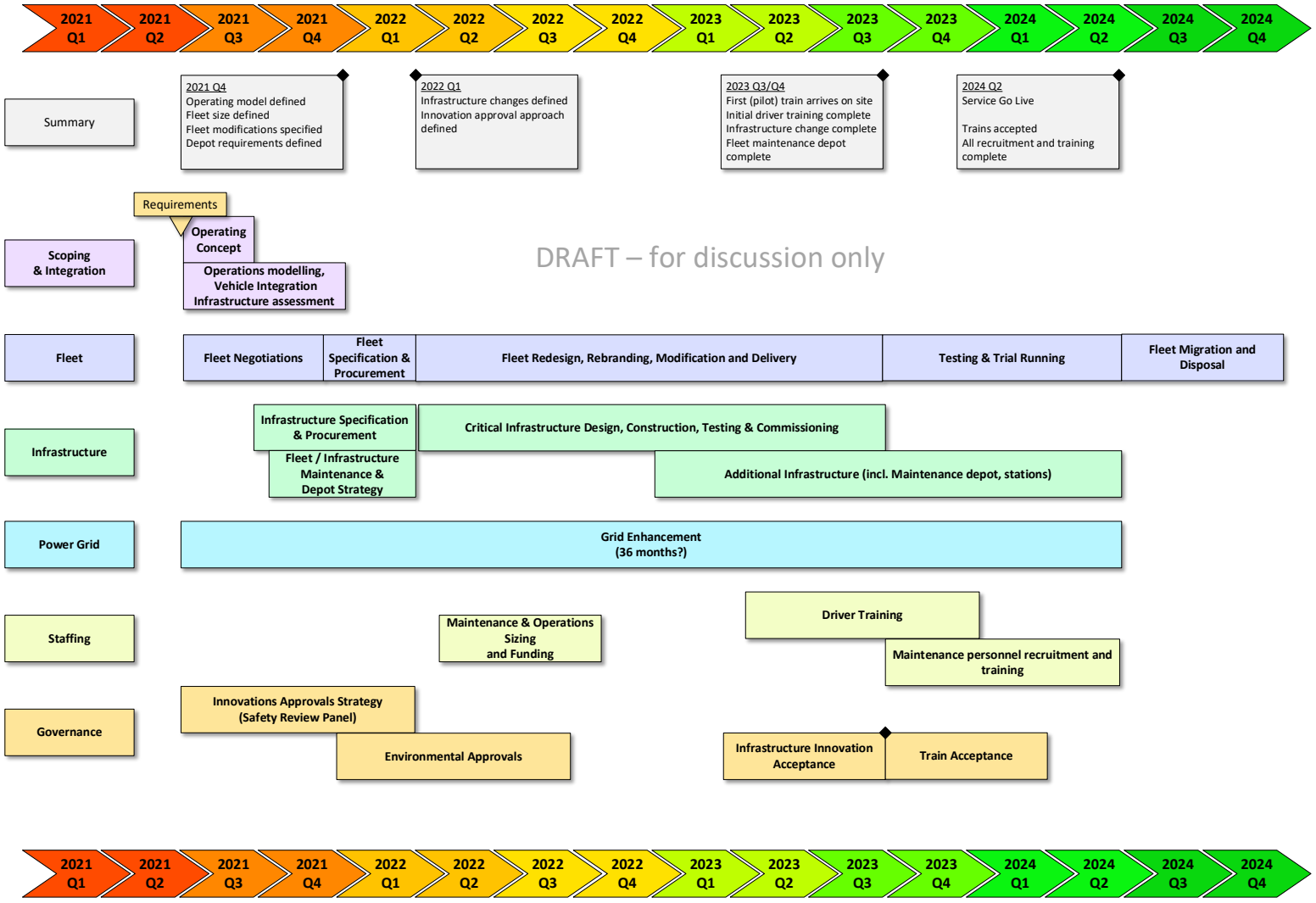
Transformation Planning

- Detailed technology & electrification study underway
  - Technology survey (Battery/Hydrogen)
  - Line specific whole life cost comparison to determine how much catenary to install versus battery/hydrogen/diesel bimode operation
  - Building up to a Rail decarbonization roadmap
- Just starting Fleet & Facilities planning to determine
  - Fleet needs & sizing based on technology recommendations
  - Maintenance & layover Facilities need to support them
- Boston–Providence EMU Pilot feasibility…

Boston-Providence EMU Pilot Update

- Providence Line already electrified to Providence
  - Missing 1.7-mile gap at Attleboro station is being filled
  - Potential need for additional feed and transformer station is being modelled
  - Investigating staged introduction of EMUs and impact of new Acela fleet
  - Low bridges are being surveyed for potential conflict with the range of EMUs under consideration
- Coordinating with Amtrak and Utilities
- Acquire or lease existing Buy America compliant rolling stock
  - Studying potential modifications required to infrastructure or rolling stock
    - Need to evaluate benefit/cost of high level boarding only and single versus bi-level EMUs
  - Investigating major procurements that have unneeded options which may be transferable
    - Talking to 3 entities that have options for delivery in the next 2-4 years
    - Investigating potential for a trial of an in service EMU
- Layover & maintenance facility
  - Explore interim light maintenance options
  - Develop plans to electrify existing layover at Pawtucket

Illustrative EMU Pilot timeline



Phase 1 Electrification

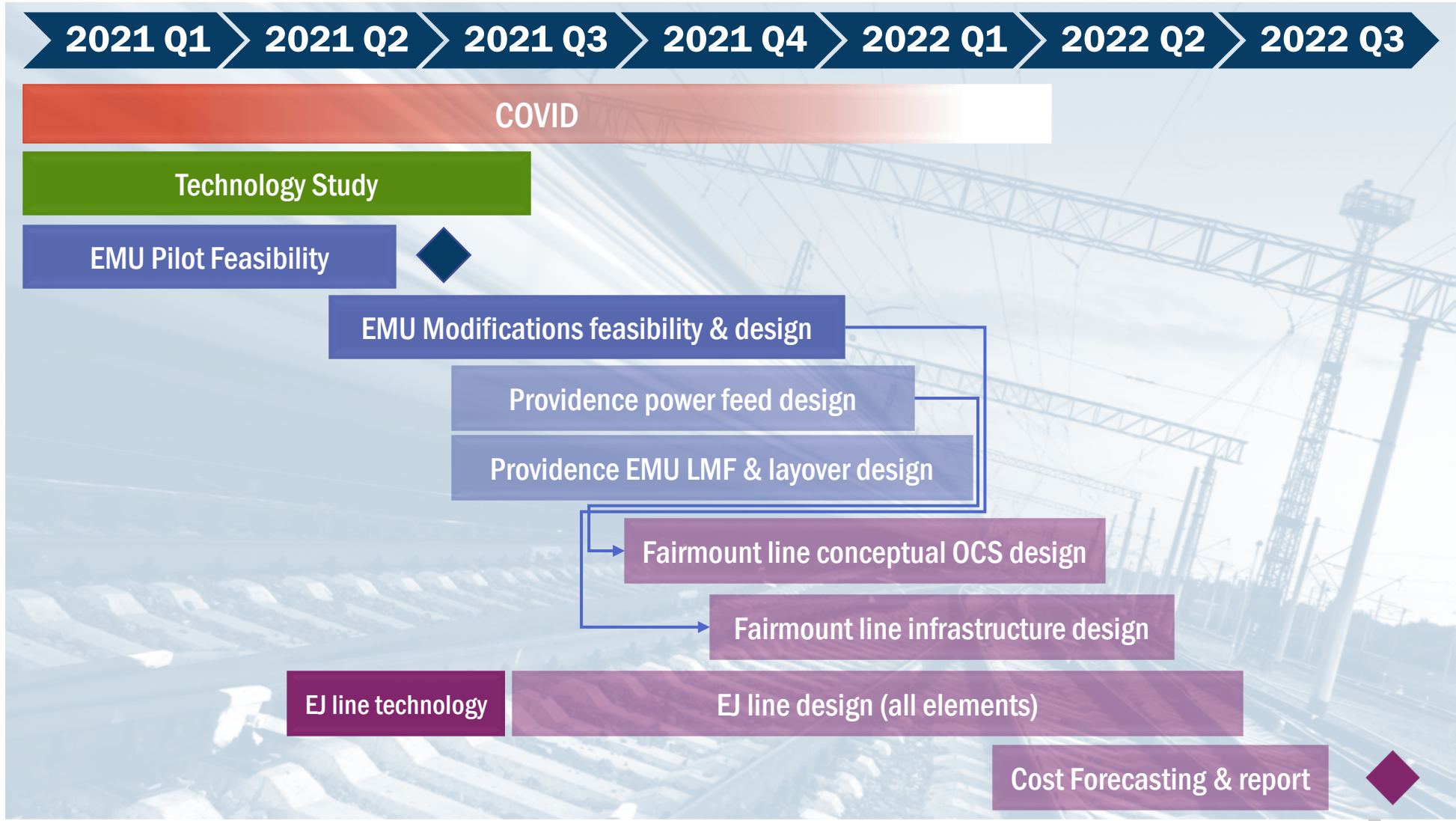
Funded vs. Unfunded Design Scope

- Providence Line
  - Funded EMU Pilot Feasibility includes
    - Traction power study
    - Vertical clearance needs
    - Platform modifications & grounding needs
    - Rolling stock modifications
    - Facility needs
  - Unfunded:
    - Design of modifications to rolling stock
    - 30% Design & environmental screening of power feed upgrades
    - 30% Design & environmental screening of infrastructure changes
    - 10% Design & environmental screening of EMU layover and potentially maintenance facilities

- Cost and duration of design work is dependent upon findings of feasibility study, especially the extent of vertical clearance and train modification work.
- Based upon initial findings the unfunded work is estimated at $5-10m and will take 12-18 months

- Fairmount Line
  - Funded technology planning includes
    - Traction power study
    - Facility needs
    - Feasibility to use power feed data from Providence Line
    - Feasibility to use same rolling stock in shorter consist
  - Unfunded:
    - 10% Design of OCS
    - 10% Design of infrastructure changes (bridges, grounding, high level platforms, signal modifications)
- Boston to Beverly (EJ Line)
  - Funded Technology planning includes
    - traction power study
    - Facility needs
  - Unfunded:
    - 10% Design of OCS
    - 10% Design of infrastructure changes (bridges, drawbridges, tunnels)
    - 10% Design of signals/safety system changes (grade crossings)
    - 10% Design of track changes
    - Strategy for rolling stock
    - Planning & 10% Design of maintenance facilities & layover

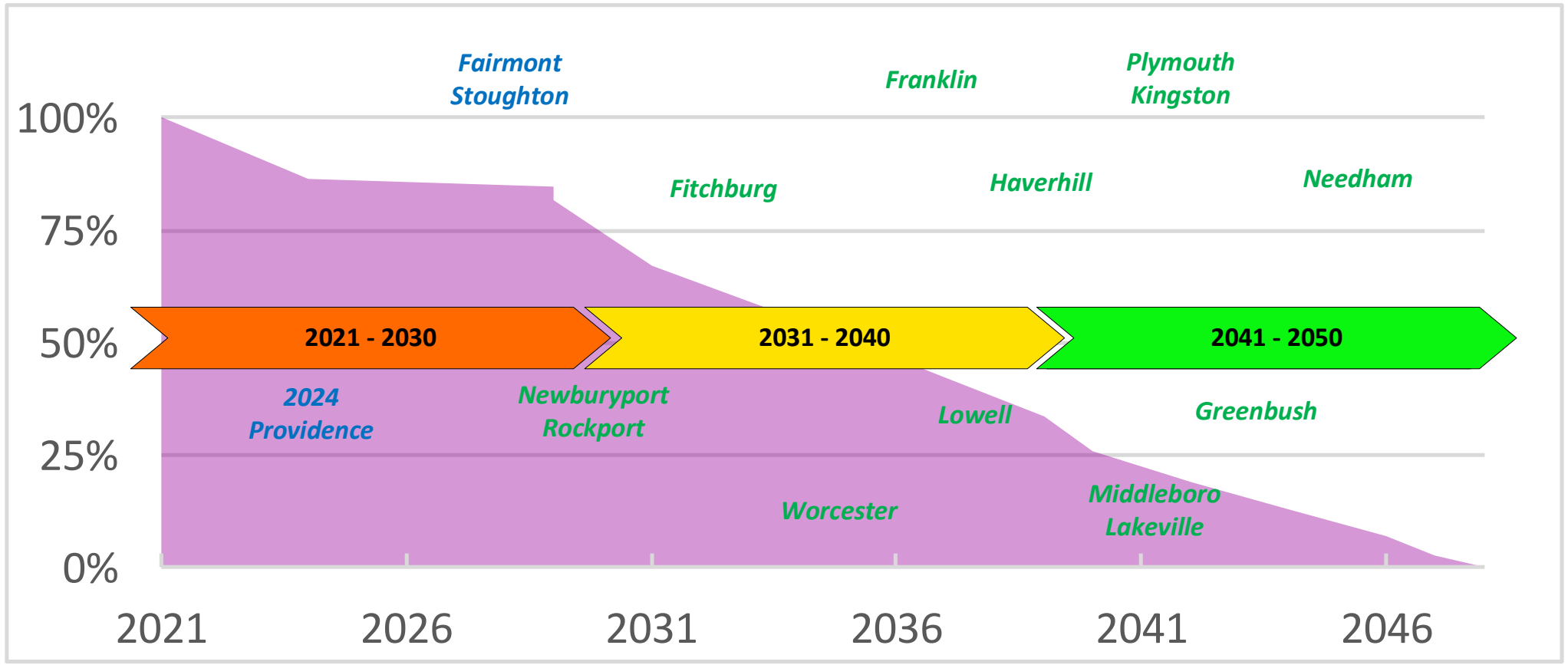
Approach to Phase 1 Conceptual Design



Note: Pale box signifies pending programing decisions

Appendix

Illustrative phasing & decarbonization roadmap



Assumed Technology:

Blue – Overhead Catenary
Green – Battery (with OCS)

Please note:

- Preliminary results based on energy modeling at the line level only
- Phasing purely indicative and financial unconstrained
- Does not include construction or infrastructure maintenance carbon emissions
- Assumes all energy continues to be sourced from renewables
- Baseline is 2019

DRAFT – for discussion only

Deadline – Aging Locomotive Fleet

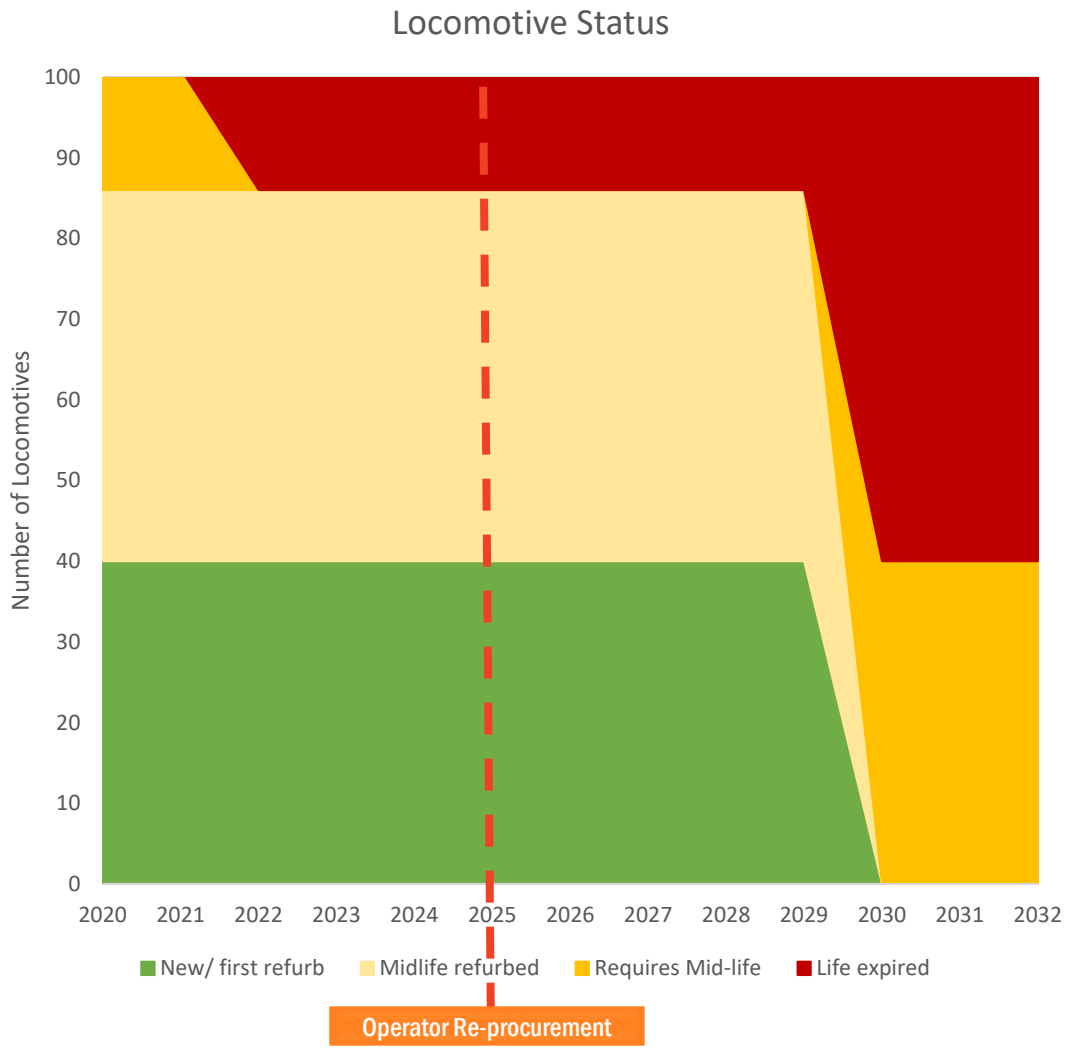


Illustration of potential cliff by 2030

- Assuming GP40s (built 1974) mothballed and eventually retired
- F40-3C (built 1980s) just rebuilt again to give 10yrs of additional life and Tier 0+ emissions status
- HSP46 are Tier 2 but need first refurb soon and midlife before 2030
- Significant risk emissions requirements are tightened before 2030
- Amtrak current diesel locos are Tier 4 compliant by comparison

Target Headways (min)

Line/ Segment	2021 Clockface?	Spring 2021 Peak	Spring 2021 Off-Peak	Transformation Peak	Transformation Off- Peak
Beverly (Urban rail)	🕐🕐	**30**	**30**	**15**	**15**
Newburyport	🕐	60	90	30	60
Rockport	🕐	60	90	30	60
Providence	🕐	**60**	**60**	**30**	**30**
Stoughton	🕐	**60**	**120**	**30**	**60**
Fairmount	🕐	**45**	**45**	**15**	**15**
Worcester - key stations - local service (urban or zonal)	🕐🕐 🕐	30 60	60 60	15 30	15 60
Franklin	🕐	60	60 (to Walpole) 120 (beyond)	30	60
Needham	🕐	60	60	15-30	15-60
Haverhill		45	45 (to Reading) 90 (beyond)	15-30	15-60
Lowell (plus Nashua/Manchester)	Off peak	45	60	15-30	15-30
Fitchburg	🕐	60	60	15 (to Brandeis)	15 (to Brandeis) 30 (beyond)
Middleborough (plus Fall River/SCR)		60	70-80	30-45	60-90
Kingston		60	70-80	30	60
Greenbush		60	70-80	30	60

Notes

- **Bold** indicates Transformation Phase 1
- Transformation headways purely indicative
- Middleborough impacted by South Coast Rail Phase 1
- Worcester line includes express, zonal local/express and urban local services to reduce journey time

Clock face Schedules

- Lynn inbound example
  - 30 minute headway
  - 04 minutes and 34 minutes past the hour 6:34am-4:34pm

NEWBURYPORT/ROCKPORT LINE **2021 Spring Schedule**
Effective April 5, 2021

Moving Forward Together.
In response to COVID-19, we continue to adapt our service to meet your needs.

B: Due to construction activities for the Gloucester Drawbridge Replacement project, bus shuttles will replace train service between Rockport, Gloucester, West Gloucester (and Manchester on designated outbound trips) on the Rockport Line. On weekends, bus shuttles replace train service between Beverly and all stations on the Rockport Line. Buses may depart intermediate stations in advance of schedule. Bicycles cannot be taken on substitute bus service.

Monday to Friday

Inbound to Boston

			AM													PM													
ZONE	STATION	TRAIN #	140	100	142	102	144	104	146	106	148	108	150	192	110	152	112	154	114	156	198	116	158	118	160	120	162	122	124	164
8	Rockport		-	B 4:58	-	B 6:03	-	B 7:03	-	B 8:03	-	B 9:03	-	-	B 10:33	-	B 12:03	-	B 1:33	-	-	B 3:03	-	-	-	B 5:33	-	B 7:33	B 8:40	-
7	Gloucester		-	B 5:05	-	B 6:10	-	B 7:10	-	B 8:10	-	B 9:10	-	-	B 10:40	-	B 12:10	-	B 1:40	-	-	B 3:10	-	-	-	B 5:40	-	B 7:40	B 8:47	-
7	West Gloucester		-	5:21	-	6:26	-	7:26	-	8:26	-	9:26	-	-	10:56	-	12:26	-	1:56	-	-	3:26	-	-	-	5:56	-	7:56	9:03	-
6	Manchester		-	5:28	-	6:33	-	7:33	-	8:33	-	9:33	-	-	11:03	-	12:33	-	2:03	-	-	3:33	-	-	-	6:03	-	8:03	9:10	-
5	Beverly Farms		-	5:34	-	6:39	-	7:39	-	8:39	-	f 9:39	-	-	f 11:09	-	f 12:39	-	f 2:09	-	-	f 3:39	-	-	-	f 6:09	-	f 8:09	f 9:16	-
4	Montserrat		-	5:40	-	6:45	-	7:45	-	8:45	-	f 9:45	-	-	f 11:15	-	f 12:45	-	f 2:15	-	-	f 3:45	-	-	-	f 6:15	-	f 8:15	f 9:22	-
8	Newburyport		4:49	-	5:54	-	6:54	-	7:54	-	8:54	-	9:54	-	-	11:24	-	12:54	-	2:24	-	-	3:54	-	5:05	-	6:54	-	-	9:39
7	Rowley		4:54	-	5:59	-	6:59	-	7:59	-	8:59	-	f 9:59	-	-	f 11:29	-	f 12:59	-	f 2:29	-	-	f 3:59	-	f 5:10	-	f 6:59	-	-	f 9:44
6	Ipswich		5:00	-	6:05	-	7:05	-	8:05	-	9:05	-	10:05	-	-	11:35	-	1:05	-	2:35	-	-	4:05	-	5:16	-	7:05	-	-	9:50
5	Hamilton/Wenham		5:06	-	6:11	-	7:11	-	8:11	-	9:11	-	f 10:11	-	-	f 11:41	-	f 1:11	-	f 2:41	-	-	f 4:11	-	f 5:29	-	f 7:11	-	-	f 9:56
5	North Beverly		5:10	-	6:15	-	7:15	-	8:15	-	9:15	-	f 10:15	-	-	f 11:45	-	f 1:15	-	f 2:45	-	-	f 4:15	-	f 5:33	-	f 7:15	-	-	f 10:00
4	Beverly		5:15	5:45	6:20	6:50	7:20	7:50	8:20	8:50	9:20	9:50	10:20	10:50	11:20	11:50	12:50	1:20	2:20	2:50	3:20	3:50	4:20	5:05	5:38	6:20	7:20	8:20	9:27	10:05
3	Salem		5:19	5:49	6:24	6:54	7:24	7:54	8:24	8:54	9:24	9:54	10:24	10:54	11:24	11:54	12:54	1:24	2:24	2:54	3:24	3:54	4:24	5:09	5:42	6:24	7:24	8:24	9:31	10:09
3	Swampscott		5:26	5:56	6:31	7:01	7:31	8:01	8:31	9:01	9:31	10:01	10:31	11:01	11:31	12:01	1:01	1:31	2:31	3:01	3:31	4:01	4:31	5:16	5:49	6:31	7:31	8:31	9:38	10:16
2	Lynn		5:29	5:59	6:34	7:04	7:34	8:04	8:34	9:04	9:34	10:04	10:34	11:04	11:34	12:04	1:04	1:34	2:34	3:04	3:34	4:04	4:34	5:19	5:52	6:34	7:34	8:34	9:41	10:19
2	River Works		f 5:32	f 6:02	f 6:37	f 7:07	-	f 8:07	f 8:37	-	-	-	-	-	-	-	-	-	f 2:37	f 3:07	f 3:37	f 4:07	f 4:37	f 5:22	f 5:55	f 6:37	-	-	-	f 10:22
1A	Chelsea		5:39	6:09	6:44	7:14	7:43	8:14	8:44	9:13	f 9:43	f 10:13	f 10:43	f 11:13	f 11:43	f 12:13	f 1:13	f 1:43	f 2:44	f 3:14	f 3:44	f 4:14	f 4:44	f 5:29	f 6:02	f 6:44	f 7:43	f 8:43	f 9:50	f 10:29
1A	North Station		5:53	6:24	6:58	7:29	7:57	8:29	8:58	9:27	9:56	10:28	10:57	11:26	11:58	12:27	1:28	1:57	2:59	3:28	3:57	4:29	4:58	5:44	6:16	6:59	7:57	8:58	10:05	10:43