Massachusetts Bay Transportation Authority

Future Proofing Transit: Advancing Climate Resiliency

Climate Change Resiliency at the MBTA

September 26, 2018 APTA Annual Conference – Nashville TN

Overview

- **MBTA's Experience in Extreme Storm Impacts**
- **Transportation Vulnerabilities to Weather and Climate Stressors**
- **MBTA Activities**
- **Next Steps**

WINTER OF 2015 --- MOST SEVERE WINTER IN BOSTON'S RECORDED HISTORY

Snow Fall Tally:

- Prior to January 26: 5.5”
- January 26: 24.6”
- Feb 2nd: 16.2”
  - **SUPER BOWL PARADE**
- Feb 10th 23.8”
- Feb 15th: 16.2”

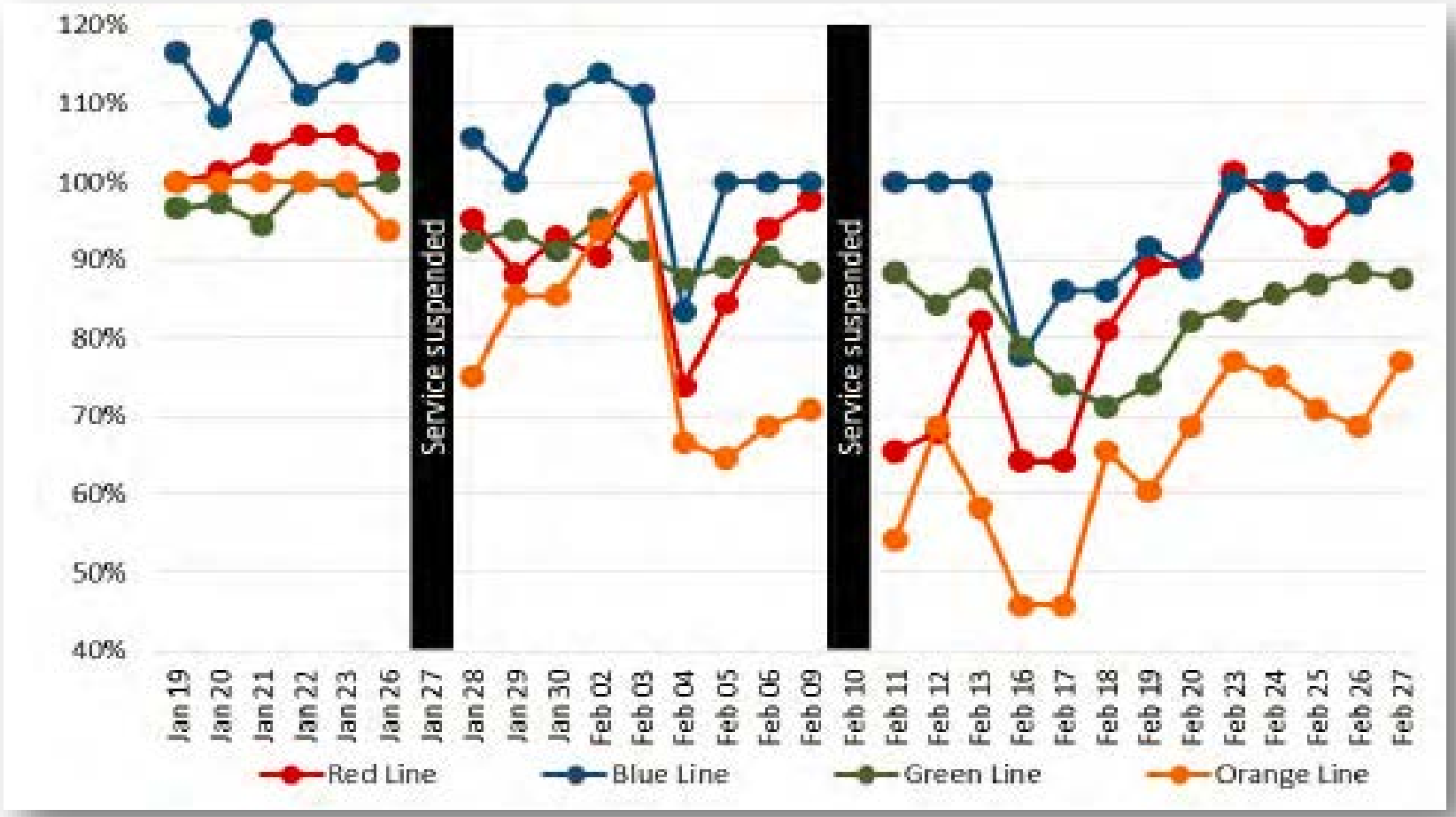
TOTAL SNOW OVER 20 DAY PERIOD

- 6.75 feet of snow

…with Severe Impacts on the System

- Up to 8 inches of ice coating the rails and 6 foot snow drifts along the right of way
- Significant snow accumulations and Bitter cold Stretch severely disrupted operations:
  - Interlocking, third rail, switched and crossing affected
  - Extensive traction motor damage to vehicles
  - Yards and Garages effectively shut down

Vehicle Availability as Low as 40% at Some Times



Transportation Vulnerabilities to Weather and Climate

Example Sensitivities:

- ***SLR and storm surge***
  - Inaccessible facilities
  - Structural damage
  - Long-term impacts from exposure to seawater—Corrosion
- ***Winter weather***
  - Inaccessible facilities and track
  - Ice damage to equipment, including switches
  - Vehicle failure, brittle rail, frost heaves in track-bed, broken pavement from ice expansion
- ***Extreme heat***
  - Buckled rail
  - Equipment/ vehicle overheating
  - Regional brownouts
  - Employee & Customer health and safety

MBTA Strategic Plan and Resiliency Policy Directive

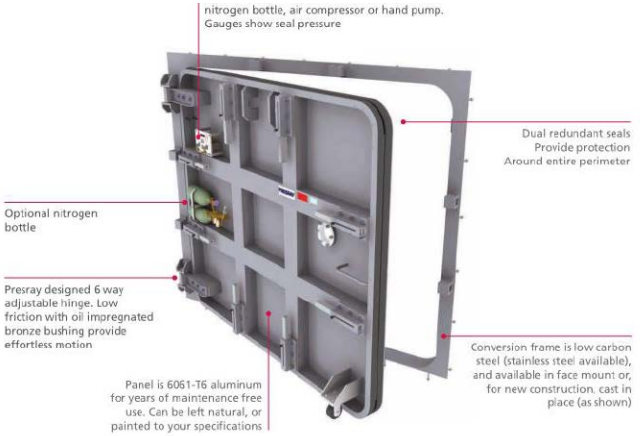
- **2017 MBTA Fiscal Management Control Board (FMCB) Strategic Plan**.
  - › Prioritizes environmental stewardship and climate resiliency

- **Draft resiliency policy directive** to meet the requirements of Executive Order 569 and build on resiliency efforts already in-progress at the MBTA. Key Principles:
  - › Cost-effective climate change adaptation planning, implementation and reporting
  - › Embed resiliency into capital programs
  - › Develop and use climate risk vulnerability assessments to identify critical locations

Federal Transit Administration (FTA) Resiliency Grants

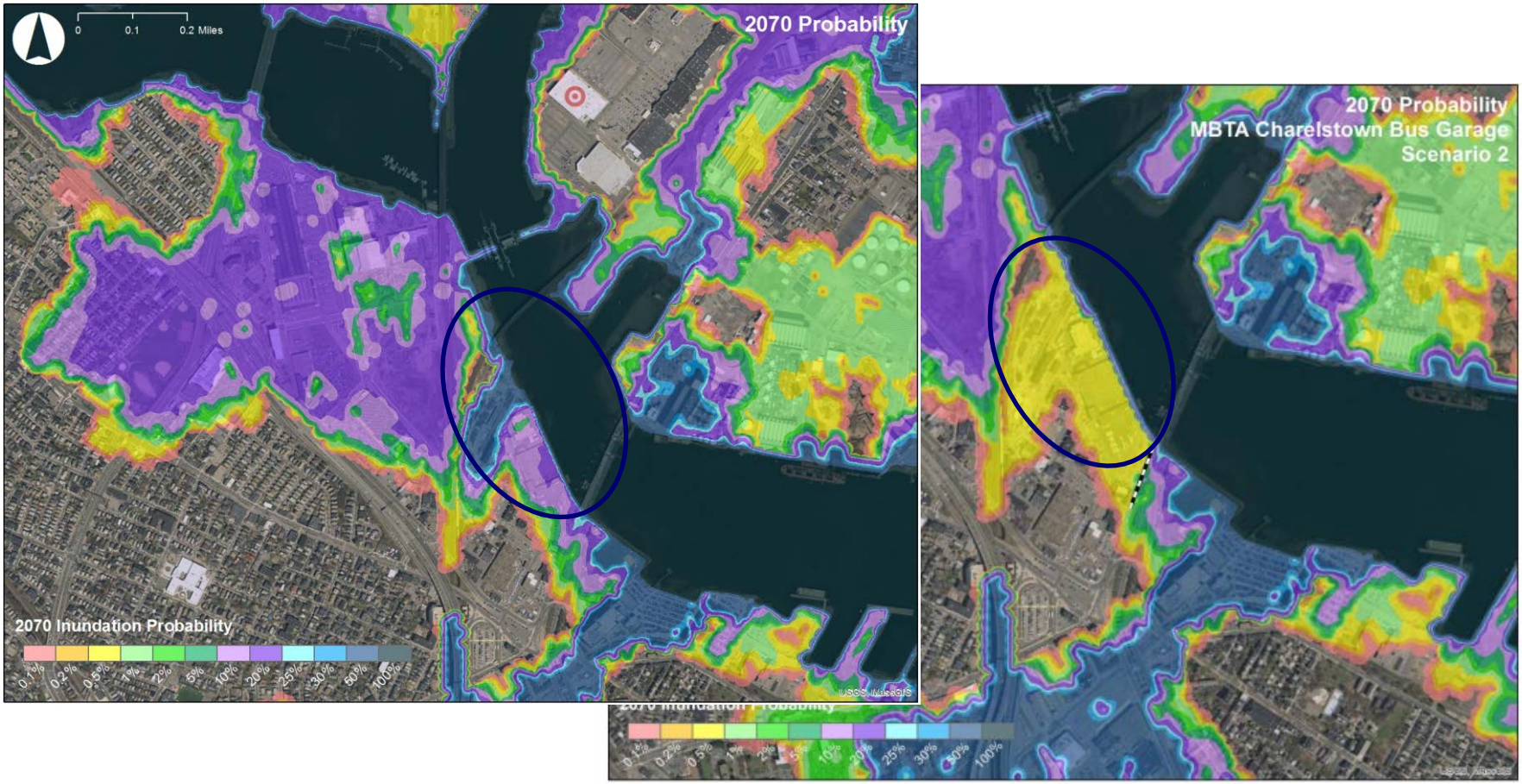
- **Charlestown Bus Yard**
  - › Rebuild Charlestown Seawall and protect the Maintenance Facility.
    - » Cost: $17.86M
    - » Estimated replacement cost: $600M

- **Fenway Portal**
  - › Inundation of Kenmore Station in 1996 via Fenway Portal
    - » Cost: $21M



FTA Grant: Charlestown Bus Garage and Somerville Rail Yard

Greatly reduced exposure to SLR and Storm Surge with proposed solution



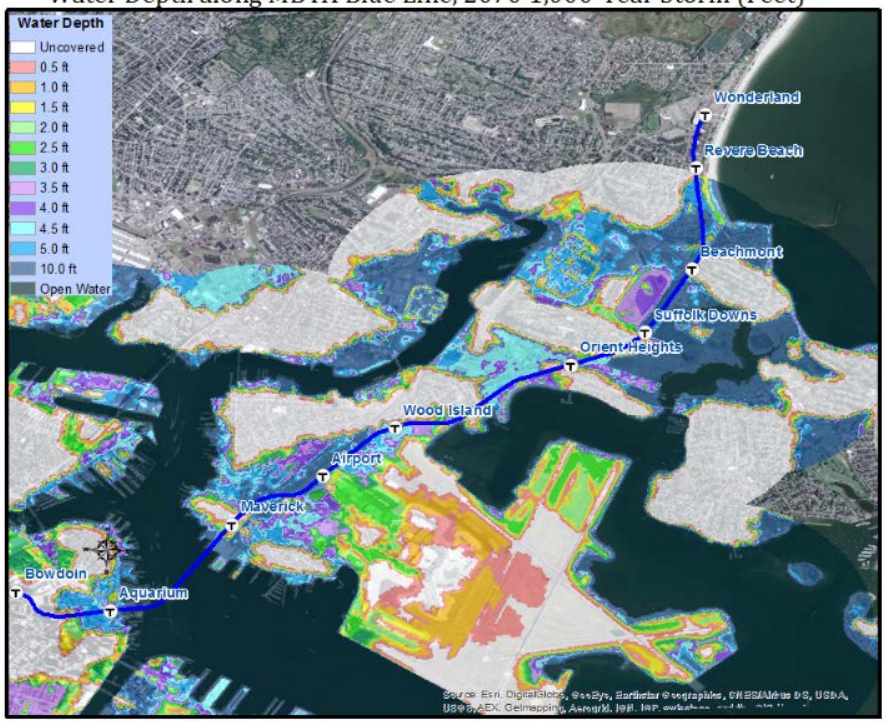
Blue Line Vulnerability Assessment (VA)

Incremental approach to identifying vulnerabilities of our system – starting with the Blue Line.

- Most areas of line < 15 feet elevation. Both above- and below- ground stations
- Serves East Boston and Revere – connections to Employment and Services.
- Connects to the Airport
- Available Engineering Information

In conjunction Community Group

Water Depth along MBTA Blue Line, 2070 1,000-Year Storm (Feet)



Blue Line Vulnerability Assessment (VA): Findings

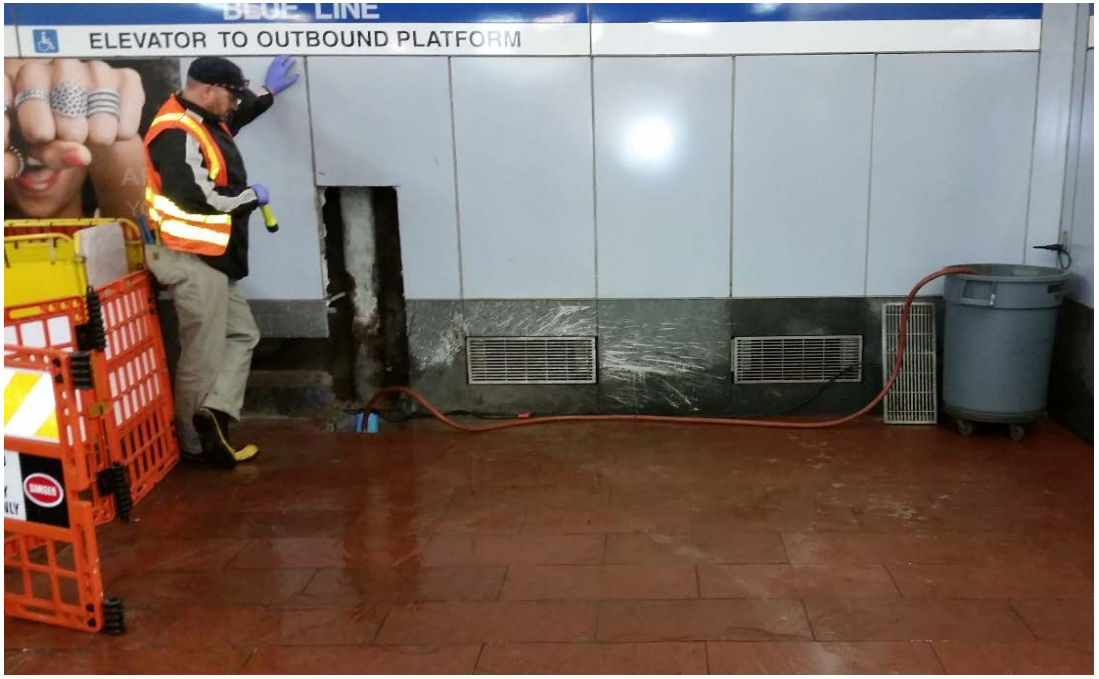
Primary concern: seawater.

- Most stations on Blue Line could be exposed to flooding by mid-century
- Flooding has already occurred at Aquarium Station and Maverick Station

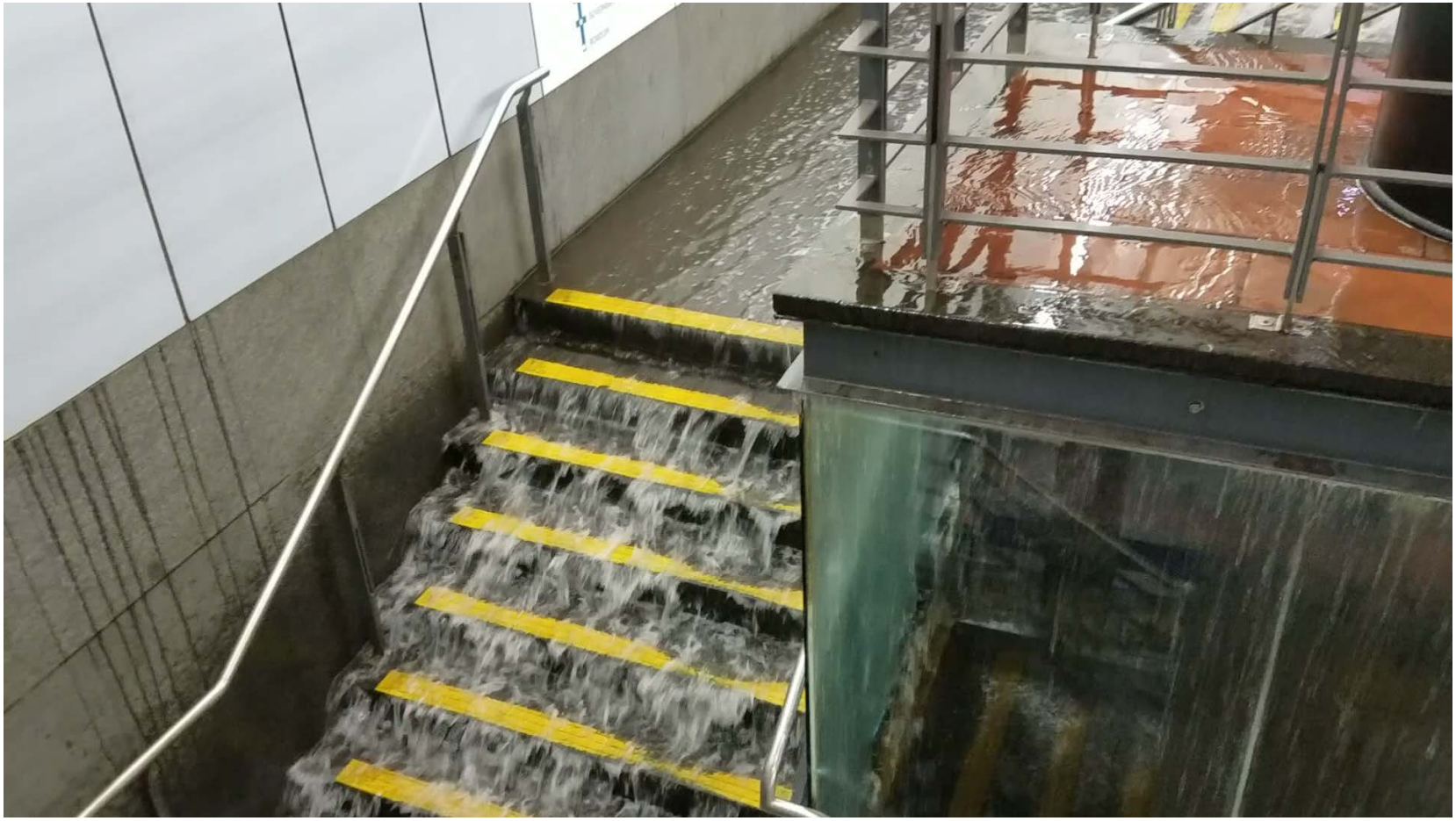
Most consequential vulnerability: Flooding

- Portal between Maverick and Airport Stations. Entrance is 7 feet below sea level.

› Salt water corrosion to rail, switches, signals, cable



Storm surge flooding at Aquarium Station, January 4, 2018



Storm surge flooding at Aquarium Station, January 4, 2018

Progress to Date and Next Steps

- In-house expertise (Climate Resiliency Specialist)
- Climate resiliency General Engineering Contracts
  - › Identify resiliency options for Blue Line – both the portal and the Maintenance Facility.
  - › Identify vulnerability for system-wide elements – pumps, power systems, signals and communications
  - › System-wide Vulnerability Assessments
- Develop design standards for all MBTA Capital Projects
- Incorporate weather and climate vulnerabilities in to Asset Management and State of Good Repair databases
- Use climate resiliency as a selection criteria in the capital plan
- Finalize policy directive

THANK YOU!

Andrew D. Brennan

Senior Director of Energy & Environment

Massachusetts Bay Transportation Authority

abrennan@mbta.com