SFMTA
Municipal Transportation Agency

Infrastructure and Operational Initiatives

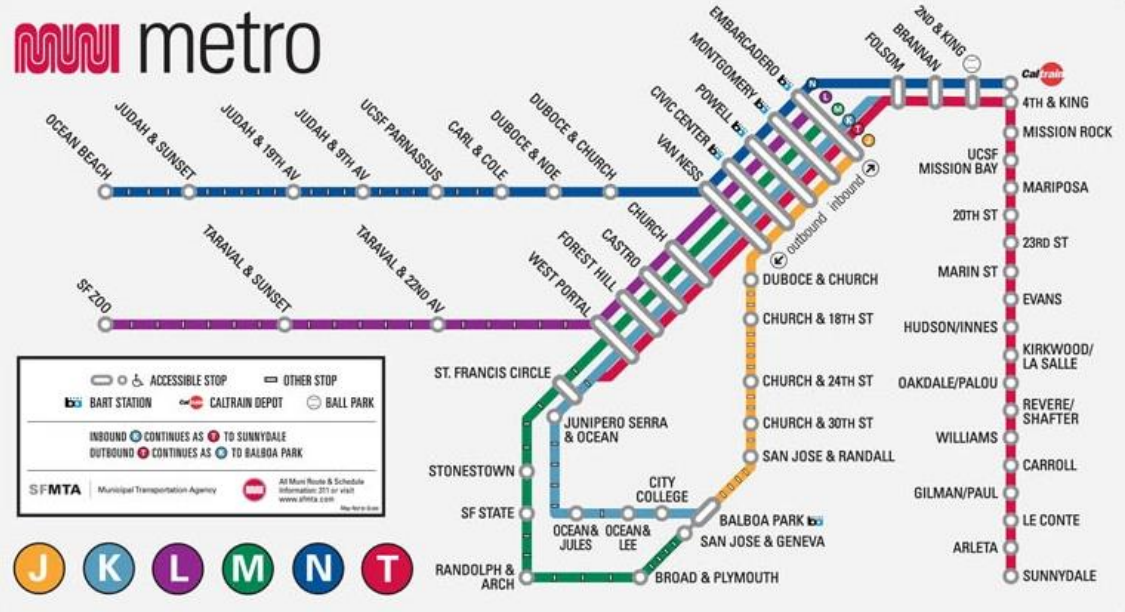
Policy & Governance Committee

September 16, 2016


Embarcadero
Station
1465B

Importance of Improving Subway Performance

- Backbone of the System serving over 100,000 daily customers
- Key to Meeting Service Goals and Delivering Special Events
- Focus of Capital Infrastructure Investments



Subway 101: Key Parts and Equipment

- **Automatic Train Control System (ATCS)**
  - Tracks train location
  - Maximizes the safe and efficient movement of a high number of trains through the subway
  - Determines flow of traffic through the subway
- **Tracks**
  - What the trains operate on!
  - Divided into blocks, normally hundreds of feet long
  - Axle counters on the tracks ensure that trains are safely operating and are a safe distance from each other
- **Signals**
  - Located to the side of the track
  - Color of lights signal to operators the correct and safe movement of the trains
- **Switches**
  - Controls safe routing of ALL trains from all six light rail lines
  - Controls movements in and out of subway and are critical in delay management

Recent Significant Service Disruptions

1. May 4, 2016: Major LRV collision on Third Street
2. May 20, 2016: Duboce Portal switch malfunction
3. May 26, 2016: Pedestrian collision
4. May 30, 2016: ATCS related major delays
5. May 31, 2016: Subway power outage
6. June 9-12: ATCS related major delays
7. July 8, 2016: Pedestrian collision
8. July 11, 2016: 4th and King significant signal delay
9. August 1, 2016: Civic Center Station fire in fan room
10. August 2, 2016: Duboce Portal switch malfunction
11. August 19: Contractor equipment failure in Sunset Tunnel significantly delays morning service
12. August 24, 2016: Duboce Portal switch malfunction
13. August 27, 2016: Embarcadero Station switch malfunction
14. August 31, 2016: Embarcadero Station switch malfunction

Subway Infrastructure Aging

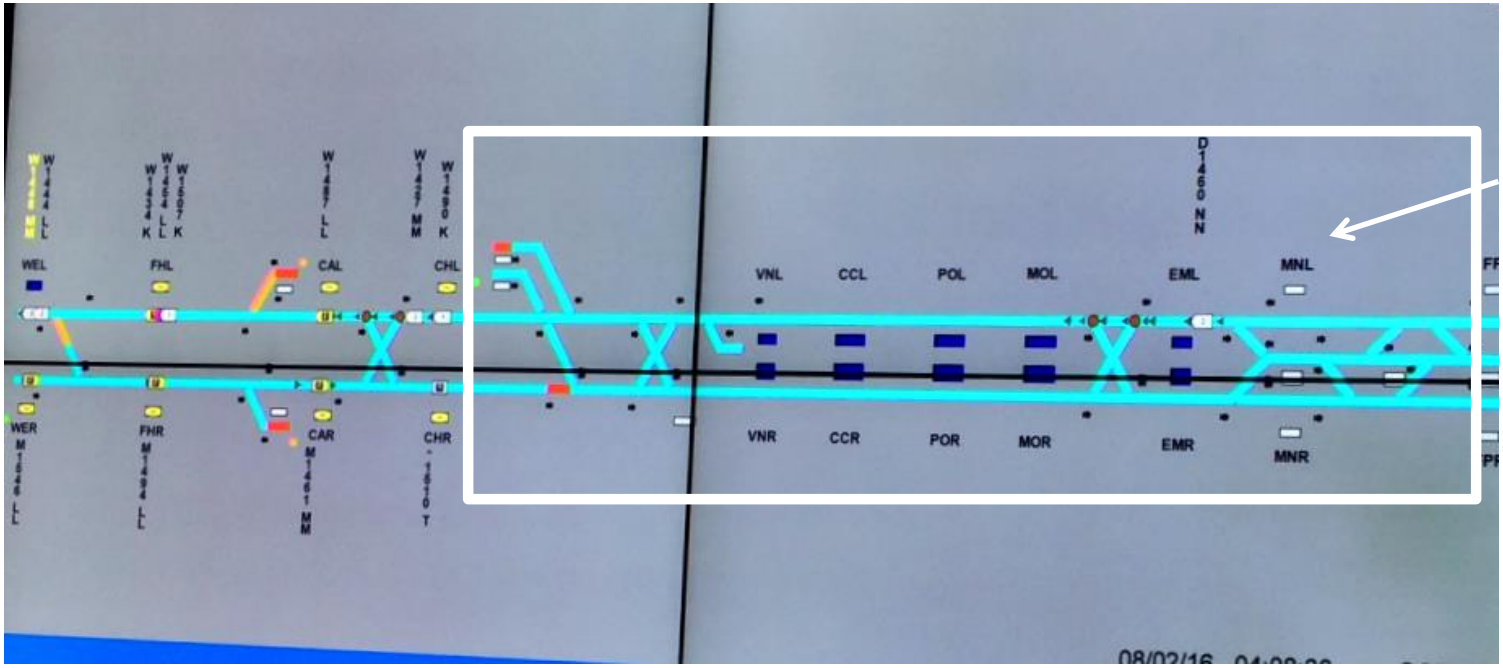
- Need to continue to prioritize programs to rehabilitate key systems that impact subway performance
- Ongoing infrastructure issues in the subway particularly at Duboce Portal and Folsom Portal/Embarcadero (e.g., switches not functioning correctly, corroded wiring)
- Recent 4th and King Interlocking Issues

Insulated track switch power wiring corroded at MMT

Temporary solution for corroded at MMT

Service Implications

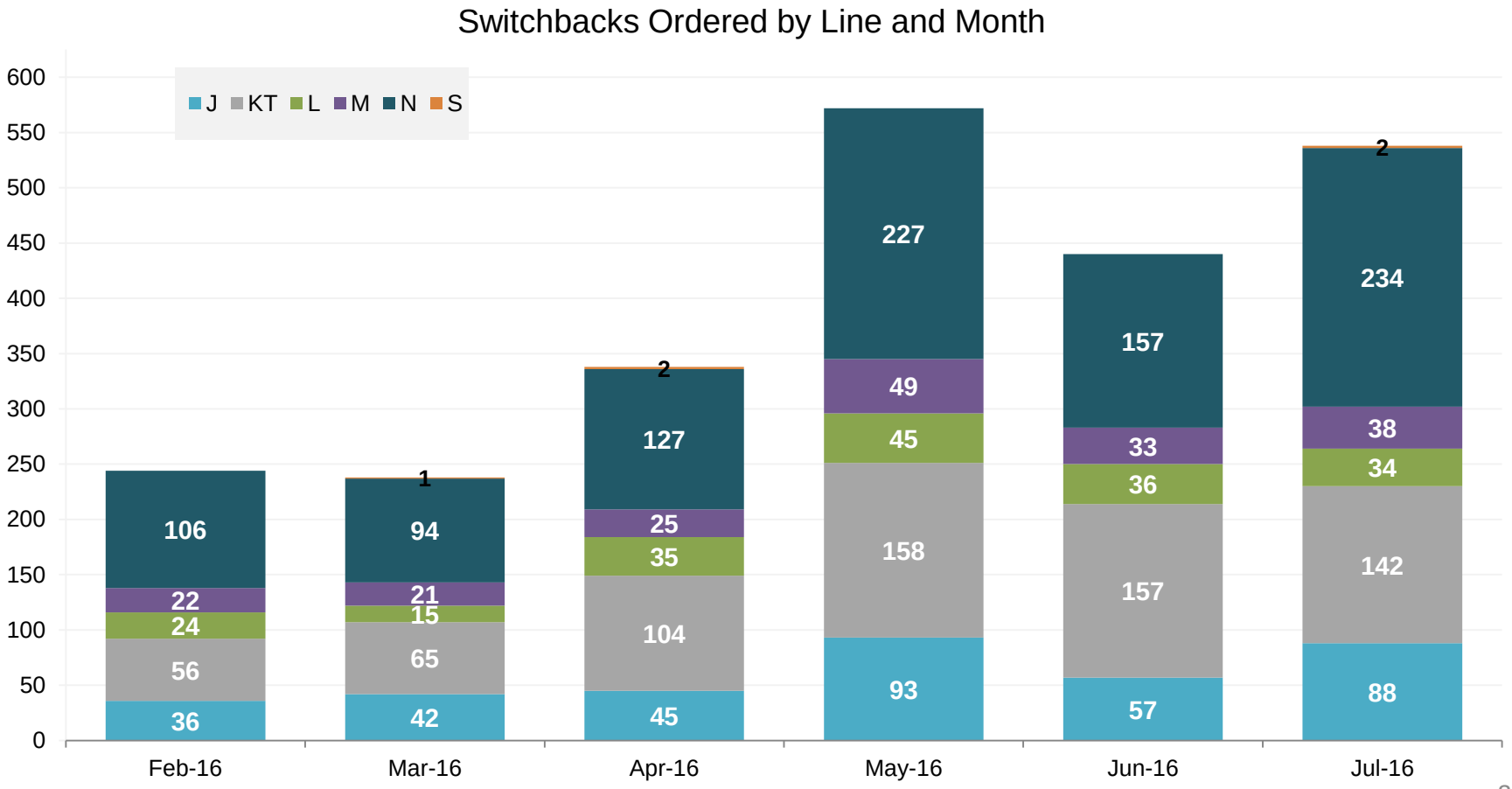
- Subway service disruptions are significant
  - Light rail accounts for nearly a quarter of all ridership – 170,000+ customers per day!
  - Customers miss connections
  - Buses are pulled from other routes to provide shuttle service along impacted subway segments
- All staff redeployed to cover gaps in service



No trains between Church and Embarcadero stations during the PM rush-hours

Switchbacks Uptick

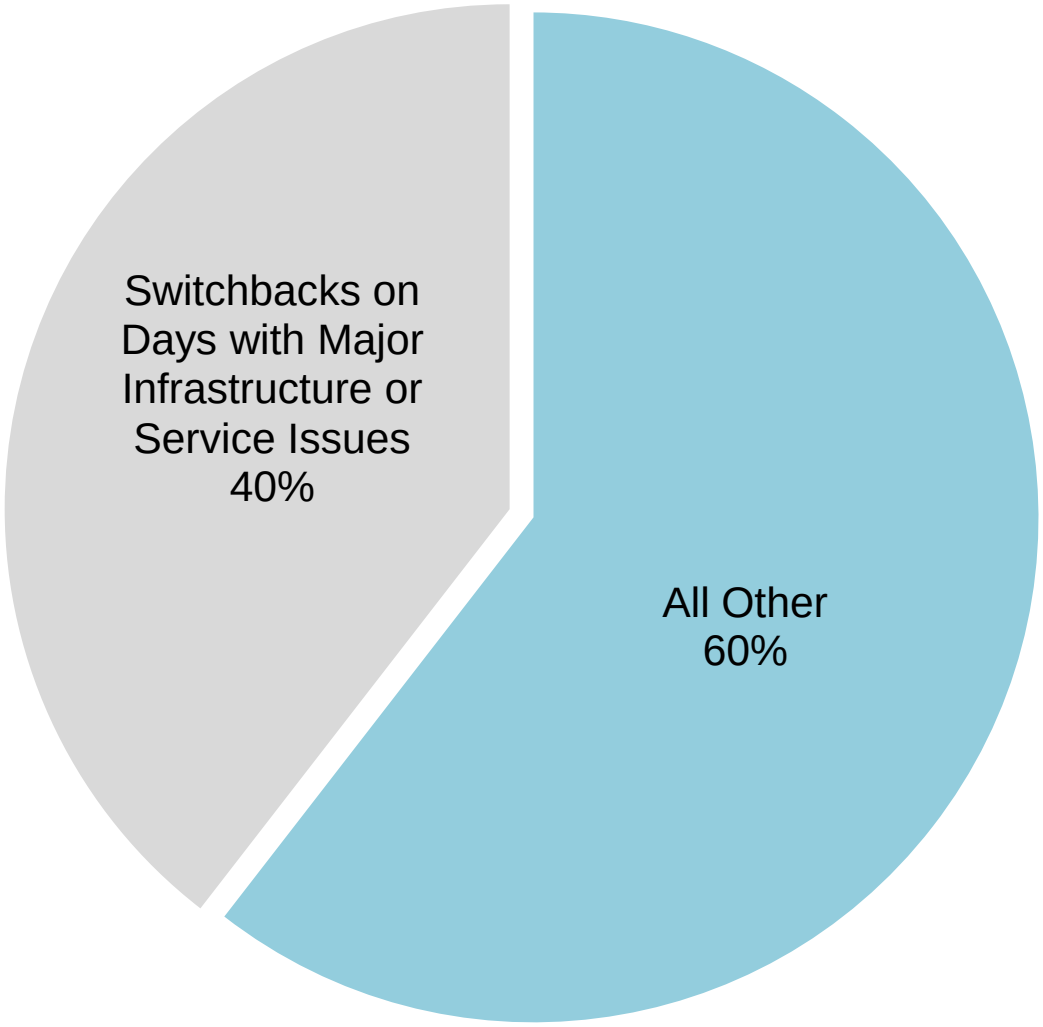
- Significant infrastructure related issues have reduced performance on the N-Judah and KT-Ingleside/Third
  - Switchbacks increased by nearly 94%
  - Concentrated on a handful of days when major infrastructure related issues occurred



Switchbacks Uptick: May Example

Example:

Six days in May accounted for 40% of the total switchbacks in May. Major service disruptions such as protests and subway infrastructure issues typically double switchback orders.



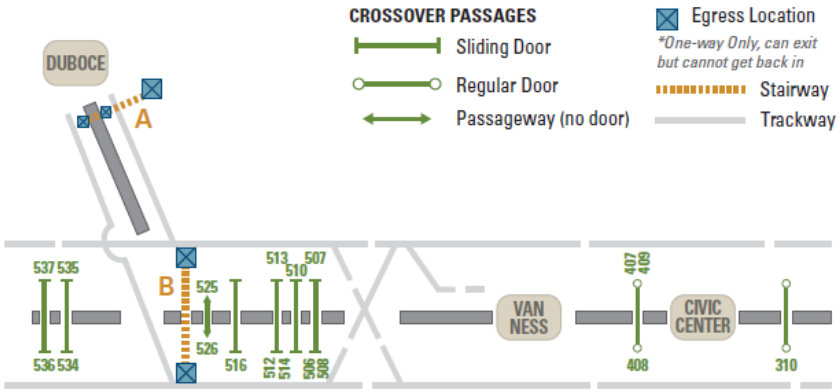
Buses taken from lines like the 38 Geary to carry rail customers

Actions: Subway Familiarization Training

Immediate

- Familiarizing operations staff with subway crossover doors/passages as well with Emergency Egress Subway Locations and signage
  - Mobile Response Unit (Maintenance)
  - Metro Rail Operations
  - Station Agents
  - Operators
  - Operations Central Control (OCC)
- Improved subway signage and wayfinding to help navigate through the subway in the event of an emergency.
- Standardized shuttle deployment protocol for emergency response situations to mitigate impact across the City

Duboce to Civic Center



Marker Location Descriptions

MARKER 536/537
Sliding door between tracks 3,700 ft. west of Van Ness Station - 100 ft. east of Church Station

MARKER 534/535
Sliding door between tracks 3,500 ft. west of Van Ness Station - 200 ft. east of Church Station

MARKER 516
2,500 ft. west of Van Ness - 1,100 ft. East of Church Station; stairway connects TR (lower track level) to TL (upper track level); doors are at either end of stairway

MARKER 513
1,300 ft. West of Van Ness Station 2,400 ft. East of Church Station (OB/IB)

MARKER 507
700 ft. West of Van Ness Station
3000 ft. East of Church Station (OB)

MARKER 408
800 ft. West of Civic Center Station
800 ft. East of Van Ness Station (IB)

STAIRWAY A
Split level with doors at each end, between Duboce TR (lower level) near signal D4 and Duboce TL (upper level) near signal D-2, both doors located on south side about 20ft. inside Duboce Portals right and left – also connects with emergency stairway with surface at the Mint Yard

STAIRWAY B
Connects TR (lower level track) to TL (upper track level)

Actions: Improving Emergency Response Procedures

Immediate

- Updating and improving 30 Transportation Management Center (TMC) Standard Operating Procedures
- Formalized incident coordination between OCC and TMC
- Familiarizing LRV controllers with subway and procedures
- Defined incident response protocol and procedures to hand crank switches and trained all rail operations and maintenance field staff
  - Including Operations Central Control and Transportation Management Center staff, Signal Department, Track Department, Rail Maintenance, Station Agent Supervisors, and Metro Rail Operations

Long Term

- Evaluate effectiveness of incident response: staff skills, vehicle needs, and wayside conditions

Actions: ATCS System Upgrade

Immediate/Medium-Term

- With implementation of ATCS software upgrades (a.k.a Revenue One), Controllers identified major software related issues requiring daily workaround from the 100+ bugs found
- The next software upgrade (Revenue Two) will address 40 of the reported bugs by mid-September and an additional 15 in October.

Summary of Issues

- Higher level of manual Controller intervention than usual required to assist ATCS operations
- During major service disruptions, delays are exacerbated as it requires additional controller intervention to clear issues

Fast-tracked Infrastructure Projects

- **Van Ness Wiring:** Finalizing contractor requirements, out to bid this year; replaces all wiring, power/control wiring, signal wiring, axle counters; wiring deteriorated
- **Embarcadero MMT Wiring:** Suffering from same issues as Van Ness wiring including water intrusion. JOC interim project to stabilize/re-wire switches within 6 months. Final project will occur after Van Ness is completed.
- **Subway Track Fastener and Rail Replacement:** Replace 24,000 rail fasteners in the Muni Metro Tunnel. The current fasteners are 40 years old and are deteriorating, and replacement of fasteners will improve safety and reliability of the subway.
- **Reconfigure 4th & King Interlocking:** Introduce two additional track circuits. The reconfiguration will improve safety and efficiency by providing separate signals for individual routes and routing train movements on a first-come first-served basis.
- **Muni Metro Track Switch Machines**: This project will change out all the heavy rail switch machines in the Subway and out on the surface. The new track switch machines will require less preventative maintenance due to their solid state technology.
- **Subway Electrical and Mechanical Systems Improvement Program:** Replace existing lighting, electrical backup systems, service panels and mechanical equipment among other infrastructure in Muni Metro Subway. The project will identify and replace broken and outdated equipment, including subway lighting, emergency battery backup systems, fire life safety systems, electrical service panels, pumps, exhaust and supply fans, and drainage improvements.

What's next?

- Twin Peaks Tunnel rail replacement
- Final subway signaling cutover
- Improve Overhead Lines and Track Department preventative maintenance
- Continue supporting capital projects to replace/rehabilitate critical infrastructure
- Replace fleet with state-of-the art vehicles
- Diversify training program for employees