

Tunnel Options Study

September 26, 2017



Study Purpose and Goals

- Initiated to address impacts resulting from cut-and-cover construction
- Goals:
 - Minimize surface disruption and socio-economic impacts
 - Reduce cut-and-cover tunnel extent
 - Identify feasible mined tunnel construction methods for further study
 - Identify major infrastructure constraints

Study Participants

- TJPA
- SFCTA
- CHSRA / WSP
- Caltrain (briefed)
- SFMTA
- AECOM
- Brierley Associates
- Parsons
- McMillen Jacobs
- Mott MacDonald
- EPC

Study Timeline



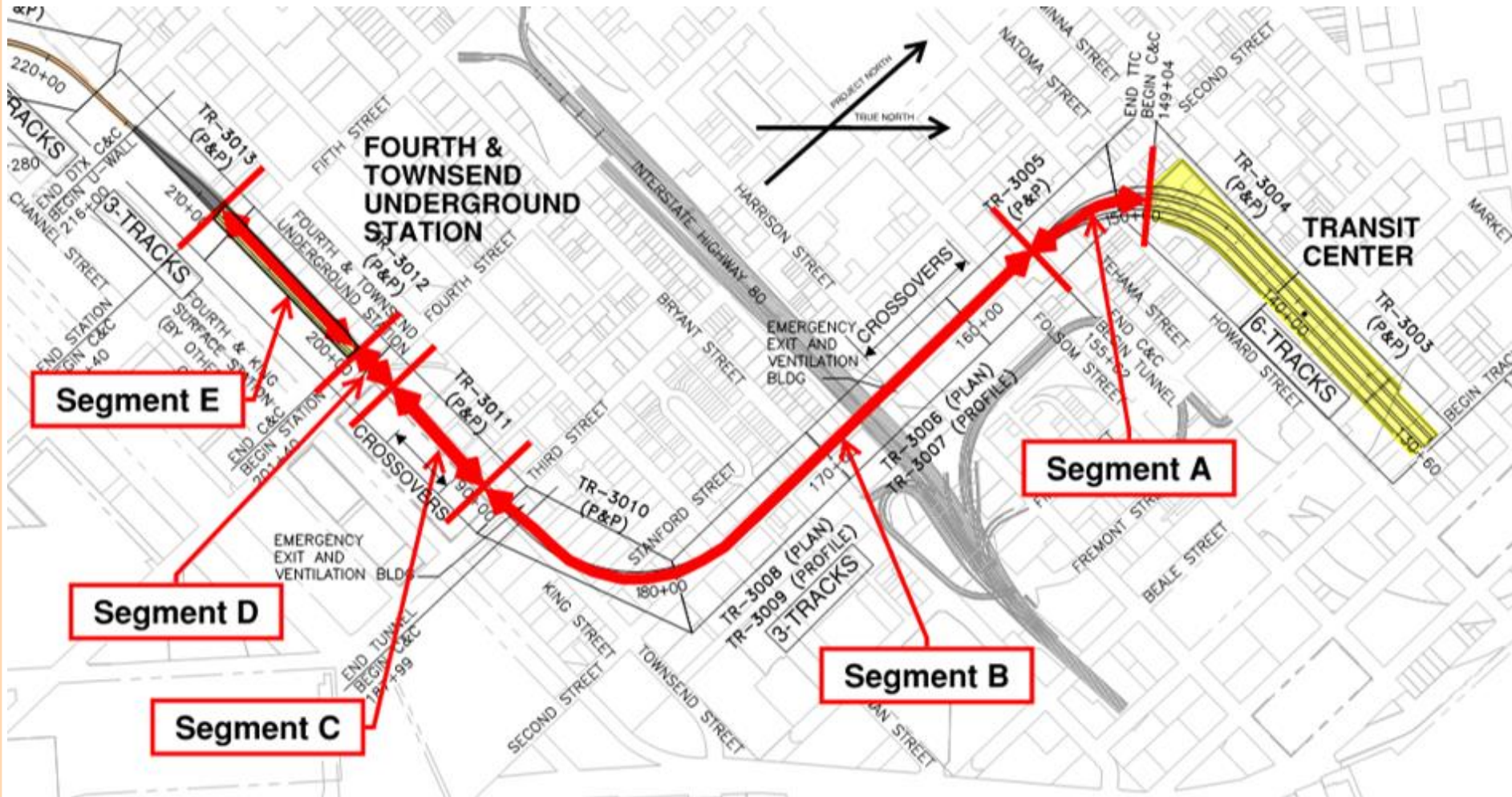
Study Initiated/Preliminary Analysis April 25 – May 30

Analysis/Coordination with Tunneling Experts May 30 - July 27

Reporting/Cost, Schedule & Risk Assessment July 27 - September 8

Presentation of Preliminary Findings to SFCTA September 26

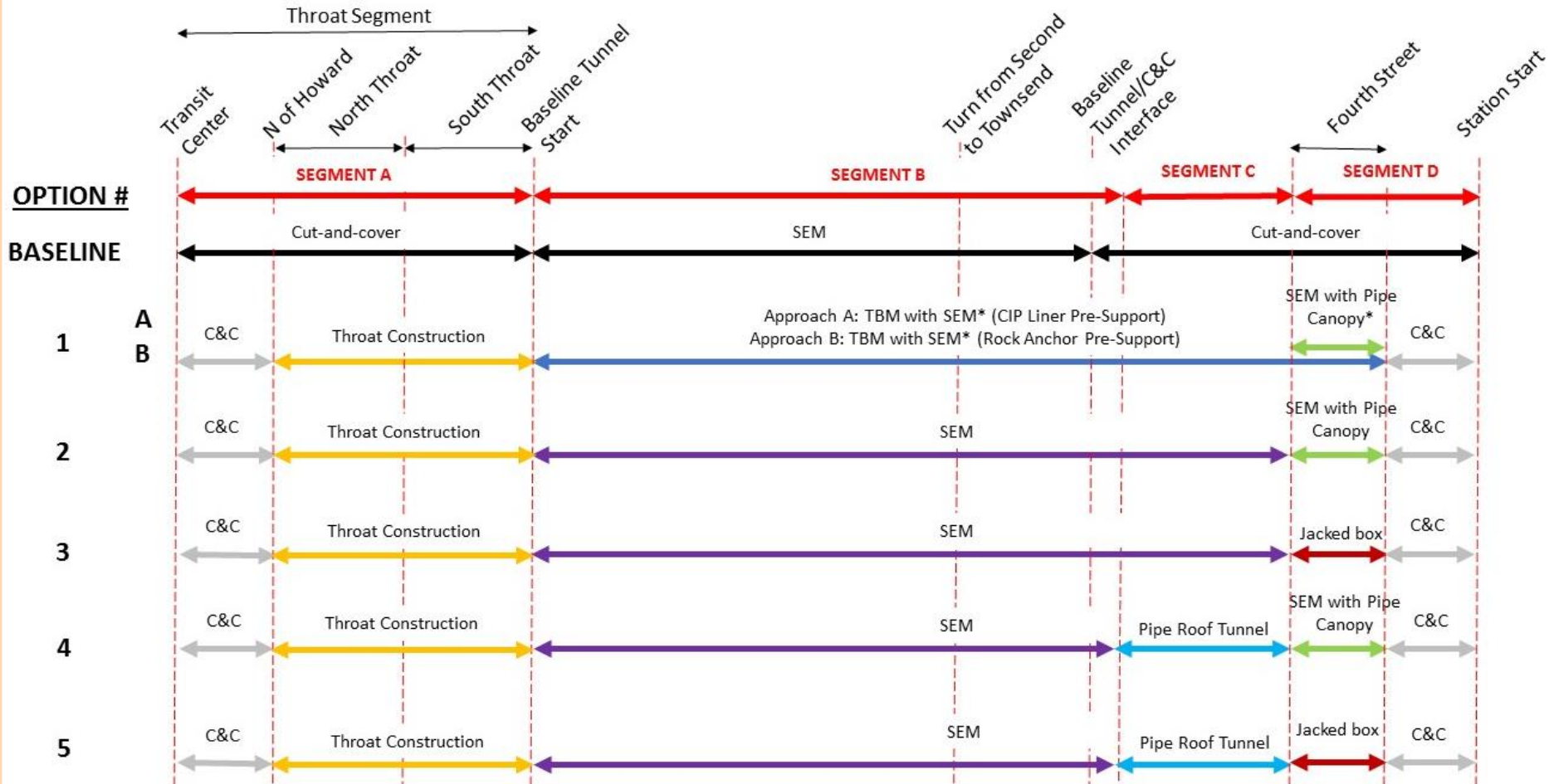
Tunnel Option Extents



Tunneling Methods Considered

- Pipe arch without pre-support walls
- Stacked drift pre-support side walls without vertical pier supports
- Precast roof beam method
- Single 3-track tunnel boring machine (TBM)
- 2-track TBM with single-track TBM
- Jacked box
- Pipe arch between micro-TBM pilot tunnels
- Pipe roof tunnel
- Sequential excavation method (SEM)
- Twin bore TBM with SEM
- Pipe canopy

Tunnel Options Summary



Preliminary Findings

- ❑ Cut-and-cover on Townsend Street can be eliminated up to the east end of the Fourth and Townsend Street Station at a reasonable cost.
- ❑ Proposed tunneling options can be accomplished without significant impacts to the project schedule.
- ❑ Reducing cut-and-cover at the Throat Structure (located at Second & Howard Sts) is feasible, but costly.
- ❑ Impacts to Central Subway will be minor and can be mitigated.
- ❑ The Fourth and Townsend Street Station will be constructed using cut-and-cover construction.

Baseline vs. Reduction



Next Steps

- ❑ Further develop mined Howard Street crossing to balance the surface disruption and cost for the Throat Structure
- ❑ Refine the constructability and schedule for the options
- ❑ Confirm ventilation requirements
- ❑ Review configuration of the TBM + SEM tunneling option



Questions?

TJPA
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