

## Executive Summary

In early 2019 the T-Third Phase 2 (Central Subway) will be complete and light rail transit (LRT) service between the Caltrain Station at 4<sup>th</sup> and King Streets and Chinatown will begin. The new service will serve approximately half of the North Beach corridor identified in the existing San Francisco long range transit expansion plan (the Four Corridor Plan) that was completed in 1994.

The T-Third Phase 3 Concept Study assesses the general feasibility of an extension of Light Rail Transit (LRT) service to North Beach and the Fisherman's Wharf area in San Francisco.

The T-Third Phase 3 Concept Study is a joint effort between the San Francisco County Transportation Authority (Transportation Authority), the San Francisco Municipal Transportation Agency (SFMTA), and the San Francisco Planning Department (The Planning Department), with SFMTA as the lead agency. The scope of work for the study was approved by the Transportation Authority, along with \$173,212 in funds to support the effort.

The scope called for a report that included the following elements and sections:

- Alignment
- Grade Options
- Construction Methods
- Transit & Traffic Analysis
- Costs & Funding
- Land Use and Economic Development

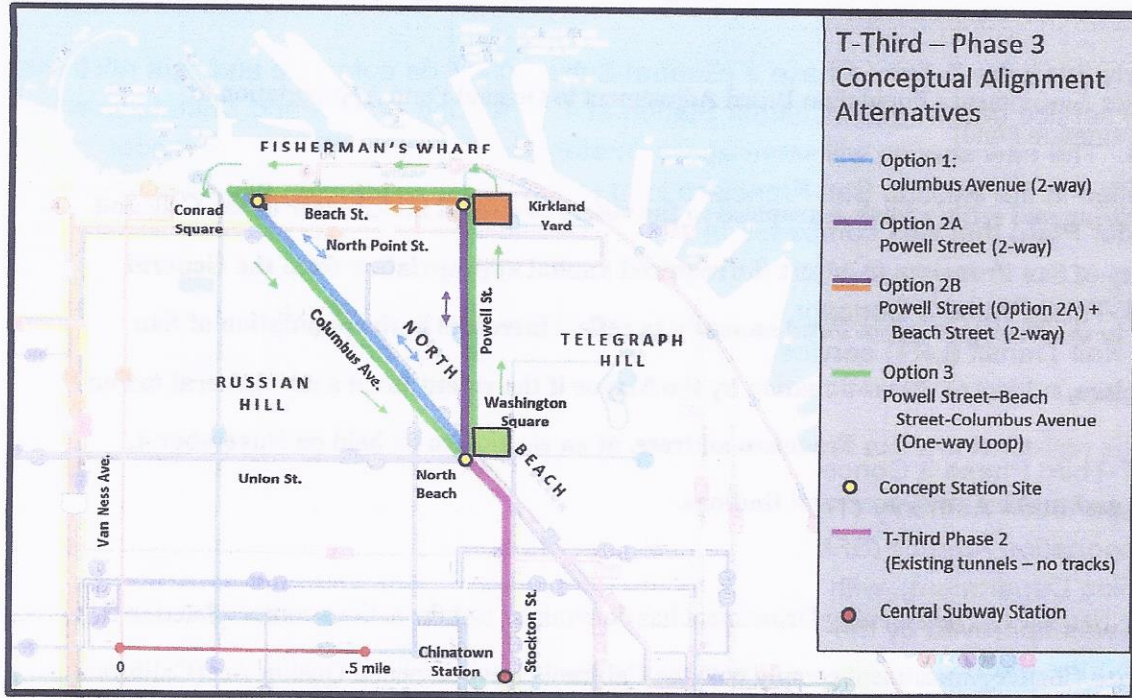
The goal of the concept study is to show preliminary technical strengths and weaknesses of sample alignments, for consideration by stakeholders, governing bodies, and the public during any future planning efforts. Four general alignments were suggested by earlier Phase 2 studies and a 2013 charrette, including two-way service along Columbus Avenue (Option 1), two-way service along Powell Street (Option 2A), two-way service along Powell Street and Beach Street (Option 2B), and a one-way loop along Powell Street, Beach Street, and Columbus Avenue.

All alignments included a North Beach station near the current terminus of the Central Subway tunnel at Columbus Avenue and Union Street. Depending on the alignment, Fisherman's Wharf station options were considered near the SFMTA's Kirkland Yard at Powell Street and Beach Street; at Conrad Square near Columbus Avenue and Beach Street; or at both locations. (See figure.)





Figure: T-Third Phase 3 Study Conceptual Alignments



For each horizontal alignment, variations of station location and of vertical alignment were considered, resulting in 14 concept alignments for study. Both surface and subway vertical alignments were analyzed, and initial analysis on tunnel issues (ground types, utilities, etc.) was performed. Use of a tunnel boring machine (TBM) appears feasible and economical, with tunnel depths of approximately 50' to 60' below ground. A launching pit and turn-back or retrieval pit would be required for this method.

Some areas, including the stations and the connection to the existing Central Subway tunnels, would require additional excavation. This work could be performed using either sequential excavation method (SEM) or cut-and-cover construction. Cost considerations and availability of staging areas will factor into choosing a construction method at each site. SEM is considered less disruptive to the surface environment, but is more expensive and requires a nearby staging area. The current TBM retrieval site (Pagoda Palace) would be feasible to use as staging for the tunnel connection; other sites are also possible. Cut-and-cover is cheaper but must be staged directly on the alignment; for stations under streets (as North Beach is likely to be, due to the tunnel connection), cut-and-cover construction would be significantly disruptive.

Estimated one-way travel times from the Chinatown station to either a station at Conrad Square or a station at Kirkland Yard ranged from 3-3.5 minutes by subway to 4.5-5



minutes by surface LRT. Service plans assumed train service every 2.5 minutes during the peak period. A representative transportation model run, using the Columbus Avenue subway concept alignment, estimated ridership of 40,000 trips per day and significant relief of overcrowding on other Muni lines in that area. Using current FTA "New Starts" guidelines, an extension is likely to receive a "high" cost-effectiveness rating for the range of costs estimated in the study.

The current 2-car trains and platforms of the Central Subway are adequate to carry projected ridership peaks, but only if the planned service levels are maintained. Some configurations could help maintain the frequent headways by adding loops or additional crossover tracks to facilitate turn-around performance. An additional 6-14 Light Rail Vehicles (LRVs, 3-7 train sets) would be needed to maintain project service levels.

Several configurations are possible for long-term future expansion past Fisherman's Wharf to neighborhoods that lie to the west - including Russian Hill and the Marina. However, expansion into these areas may require line renovations because the 2-car-length Central Subway stations may be too small to handle ridership increases.

Preliminary cost estimates of the concept alignments ranged from a low of \$367 million (subway and surface to Kirkland), to a high of \$1.400 billion (subway connecting all three locations) in 2014 dollars. Ten alignments were under \$1.0 billion and two were over \$1.0 billion (two were found to be infeasible in a constructability assessment).

Initial land use and economic development analysis showed a potential for value capture funding that could pay for 10%-30% of the capital cost via use of a community finance district or infrastructure finance district.

The representative alignments studied show that an extension is feasible and carries ridership benefits. To aid discussion of potential alignment options and trade-offs for different choices, staff evaluated the concept alignments within seven areas of consideration. (See table below.)

- Passenger Experience
- Operational Efficiency
- System Performance
- Local Operations Considerations
- Infrastructure Resiliency
- Construction Disturbance
- Capital Construction Cost & Risk

The study does not recommend a particular alignment, nor is it intended to limit alignments to the samples here. That said, the best scoring concepts were all-underground alignments, which supply greater passenger, operations, system, and resiliency benefits, but which cost approximately twice as much as surface alignments.



**Table: Evaluation Matrix**  
Evaluation Matrix

	1-1	1-2	2A-1	2A-2	2A-3	2A-4	2A-5	2A-6	2B-1	2B-2	2B-3	2B-4	3-1	3-2
Evaluation Elements	Evaluation of Concept Alternatives													
	Columbus Ave. Subway-Surface	Columbus Ave. Subway	Powell St. Subway-Surface	Powell St. subway	Powell St. Subway-Surface w/ surface short-loop	Powell St. Subway w/ surface short-loop	Powell St. Subway-Surface w/surface F-Line loop	Powell St. Subway w/ surface F-Line loop	Powell St. + Beach St. Subway-Surface	Powell St. + Beach St. Subway	Powell St. + Beach St. Surface-Subway	Powell St. + Beach St. Subway-Surface	One-Way Loop (Powell-Beach-Columbus) Subway-Surface	One-Way Loop (Powell-Beach-Columbus) Subway
Passenger Experience	0	+	0	+	-	-	-	-	-	+	NF	NF	0	+
Operational Efficiency	-	+	-	+	-	0	-	-	-	+	NF	NF	+	+
System Performance	0	+	0	+	0	+	-	-	0	+	NF	NF	+	+
Local Operations Considerations	-	+	-	+	-	0	-	-	-	+	NF	NF	-	+
Infrastructure Resiliency	+	+	0	+	0	-	0	-	0	+	NF	NF	0	0
Construction Disturbance	-	0	-	0	-	-	-	-	-	-	NF	NF	-	-
Capital Construction Cost and Risk	+	0	+	0	+	0	+	0	+	-	NF	NF	+	0
Total	-1	5	-2	5	-3	-2	-4	-6	-3	3	NF	NF	1	3
Capital Cost (\$ millions in 2014 Dollars)	407-482	848-933	367-442	837-912	406-480	875-950	454-529	924-999	443-518	1,333-1,408	NF	NF	496-571	1,087-1,139
Constructability Rating	4	5	3/4	4	3/4	2	3/4	2	3/4	4	1	2	3	3/4

An extension beyond the current terminal station at Chinatown scheduled to open in 2019 will require a new environmental review effort. The SFMTA lease to use the Pagoda Palace property as a TBM retrieval site expires on May 10, 2015. The SFMTA has a 60 day "right of first refusal" if the property owner were to place the property up for sale on the real estate market. The owner has obtained entitlement from the San Francisco Planning Commission to build a 19-unit residential structure on the site.

This study is to be incorporated into the San Francisco Bay Area Core Capacity Transit Study that is to begin in 2015.