

**ENVIRONMENTAL IMPACT STATEMENT FOR THE EXTENSION OF HISTORIC
STREETCAR SERVICE FROM FISHERMAN'S WHARF TO THE SAN FRANCISCO
MARITIME NATIONAL HISTORICAL PARK AND GOLDEN GATE NATIONAL
RECREATION AREA'S FORT MASON CENTER**



FINAL

**Task 10 Working Paper
Transit Operations Plan**

(Incorporates Ridership Assessment Working Paper - Task No. 6)

URS

**Prepared by URS Corporation for the
National Park Service – Golden Gate National Recreation Area**

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TABLE OF CONTENTS

SECTION 1.0	INTRODUCTION AND DESCRIPTION OF TASK.....	1
SECTION 2.0	CURRENT STREETCAR SERVICE.....	1
2.1	F-MARKET AND WHARVES HISTORIC STREETCAR SERVICE	1
2.2	DAYS OF OPERATION, SPAN OF SERVICE, AND HEADWAYS	2
2.3	RUNNING TIMES, OPERATING SPEED, AND ANNUAL VEHICLES MILES AND HOURS	4
2.4	VEHICLE REQUIREMENTS.....	6
2.4.1	Cars in Fleet.....	6
2.4.2	Current Vehicle Requirements.....	6
2.5	SCHEDULING AND OPERATIONS.....	7
2.5.1	Layovers	7
2.5.2	Control.....	7
2.6	RIDERSHIP.....	7
2.6.1	History of F-line Ridership Development.....	7
2.6.2	Current Ridership for the F-line.....	7
2.7	CAPACITY AND LOAD FACTORS FOR F-LINE (CURRENT).....	8
SECTION 3.0	PLANNED INITIAL E-EMBARCADERO HISTORIC STREETCAR LINE	11
3.1	PROPOSED ALIGNMENT.....	11
3.2	IMPLEMENTATION SCHEDULE FOR E-LINE.....	12
3.3	DAYS OF OPERATION, SPAN OF SERVICE, AND HEADWAYS	12
3.4	RUNNING TIMES AND OPERATING SPEED	12
3.5	VEHICLE REQUIREMENTS.....	13
3.6	ANNUAL VEHICLE MILES AND HOURS.....	13
SECTION 4.0	PROJECT DESCRIPTION FOR FORT MASON EXTENSION	15
4.1	PROPOSED ALIGNMENT.....	15
4.2	TURNAROUND AT FORT MASON.....	15
4.3	FORT MASON TUNNEL	16
4.3.1	Signaling and Interlocking for the Tunnel Segment	16
4.4	TRANSITION SEGMENT.....	17
4.4.1	Signaling and Interlocking to Control Total Number of Cars West of East Portal.....	20
4.5	STREET RUNNING SEGMENT.....	20
4.5.1	Shared Auto/Streetcar Option.....	20
4.5.2	Semi-Exclusive Eastbound Option	20
SECTION 5.0	OPERATING SCENARIOS FOR EXTENSION – TWO SERVICE PLAN OPTIONS	21
5.1	OPTION 1 – E-LINE EXTENSION TO FORT MASON AND CURRENT F-LINE SERVICE.....	21
5.1.1	Days of Operation, Span of Service, and Headways	21
5.1.2	Operating Speed, Running Times, and Annual Vehicles Miles and Hours	22
5.1.3	Vehicle Requirements.....	22
5.1.4	2030 Capacity for E-line in Option 1.....	23
5.1.5	2030 Capacity for F-line in Option 1	23
5.2	OPTION 2 – E-LINE SERVICE TO FISHERMAN’S WHARF AND F-LINE EXTENSION TO FORT MASON.....	23
5.2.1	Days of Operation, Span of Service, and Headways	23
5.2.2	Operating Speed, Running Times, and Annual Vehicles Miles and Hours	24
5.2.3	Vehicle Requirements.....	24
5.2.4	2030 Capacity for F-line in Option 2.....	27
5.2.5	2030 Capacity for E-line in Option 2.....	27
5.3	RIDERSHIP AND LOAD FACTORS	27

5.3.1	Running Times.....	27
5.3.2	Current Load Factors	28
5.3.3	Future Load Factor Estimates	30
5.3.4	Stop-by-Stop Ridership	31
5.3.5	Cumulative Effect.....	32
5.3.6	Comparison of Transit Trips with Other Modes (All Trips).....	33
5.3.7	Employee and Visitor Surveys	34
5.3.8	Employment and Population Projections.....	34
SECTION 6.0	COMPARISON OF VEHICLE REQUIREMENTS.....	35
SECTION 7.0	EXTENSION INFRASTRUCTURE	35
7.1	STATIONS/PLATFORMS.....	35
7.2	TURNBACK TRACK AT LEAVENWORTH AND BEACH	36
7.3	CABLE CAR CROSSING.....	36
7.4	JUNCTIONS.....	36
SECTION 8.0	TERMINAL OPERATIONS AT FORT MASON	37
8.1	LOOP TERMINALS	37
8.2	WYE TERMINALS.....	39
8.3	TERMINAL CAPACITY	43
SECTION 9.0	OPERATING ISSUES COMMON TO BOTH OPTIONS.....	43
9.1	OVERLAPPING E- AND F-LINE JOINT OPERATIONS ON NORTH EMBARCADERO	43
9.2	JUNCTION WITH F-LINE AT JEFFERSON AND JONES	44
9.3	JUNCTION WITH F-LINE AT BEACH AND JONES AND AT LEAVENWORTH AND BEACH.....	44
9.4	CABLE CAR CROSSING AT BEACH AND HYDE	44
9.5	VAN NESS AVENUE CROSSING	45
9.6	SINGLE-TRACK OPERATIONS THROUGH TUNNEL.....	46
9.7	SPECIAL EVENTS	48
SECTION 10.0	STREETCAR MAINTENANCE FACILITIES.....	49
SECTION 11.0	OPERATING COST ESTIMATES	50
11.1	METHODOLOGY.....	50
11.2	ADDITIONAL OPERATING COSTS.....	51

LIST OF TABLES

Table 1	Weekday Headways for F-line (Current)
Table 2	Weekend Headways for F-line (Current)
Table 3	Weekday Cycle Times for F-line (Current)
Table 4	Weekend Cycle Times for F-line (Current)
Table 5	Average Operating Speeds for Segments of F-line (Current)
Table 6	Estimated Vehicle Demand for Weekday F-line (Current)
Table 7	Ridership Development on SFMTA’s F-line
Table 8	Estimated Weekday Capacity for F-line (Current)
Table 9	Estimated Weekday Load Factors for F-line (Current)
Table 10	Daily Headways for Proposed E-line (2030)

Table 11	2030 Headways for Option 1
Table 12	2030 Cycle Times for E-line with Extension to Fort Mason (Option 1)
Table 13	Estimated 2030 Vehicle Demand for E-line Service with Extension to Fort Mason (Option 1)
Table 14	2030 Weekday Capacity for E-line with Extension to Fort Mason (Option 1)
Table 15	2030 Weekday Capacity for F-line to Fisherman’s Wharf (Option 1)
Table 16	2030 Headways for Option 2
Table 17	2030 Weekday Cycle Times for F-line with Extension to Fort Mason (Option 2)
Table 18	2030 Weekend Cycle Times for F-line with Extension to Fort Mason (Option 2)
Table 19	Estimated 2030 Weekday Vehicle Demand for F-line with Extension to Fort Mason (Option 2)
Table 20	2030 Weekday Capacity for F-line (With Extension to Fort Mason)
Table 21	2030 Weekday Capacity for E-line (to Fisherman’s Wharf)
Table 22	Weekday Current Load Factor Estimates
Table 23	2030 Weekday Future Load Factor Projections
Table 24	Stop-By-Stop Ridership on Extension – Year 2030
Table 25	Extension Load Factor Analysis
Table 26	Overall Ridership Comparison
Table 27	Daily Person Trips to Maritime Park and Fort Mason
Table 28	Total Employment and Population Projections in Maritime Park and Fort Mason
Table 29	Comparison of Current and Future Peak Vehicle Demand
Table 30	Terminal Times for Loop Options
Table 31	Terminal Times for Wye Options
Table 32	Terminal Capacity for Loop and Wye Options
Table 33	Running Times by Segment
Table 34	Option B1 (with 4.5-minute headway)
Table 35	Option B2 (with 4-minute headway)
Table 36	Special Events Car Capacity by Option
Table 37	Estimated Operating Costs
Table 38	Additional Estimated Operating Costs

LIST OF FIGURES

Figure 1	Current F-Market and Wharves Historic Streetcar Line
Figure 2	Current F-Market and Planned Initial E-Embarcadero Historic Streetcar Lines
Figure 3	Transition 1 of 2
Figure 4	Transition 2 of 2

LIST OF APPENDICES

Appendix A – SFMTA Streetcar Fleet Roster

Appendix B – Vehicle Hours and Operating Costs

Appendix C – Fort Mason Alignment with Terminal Alternatives

Appendix D – Fort Mason Turnaround Options

Appendix E – SFCTA Model Ridership and Load Factor Assumptions and Output

Appendix F – Fort Mason Employee Survey

Appendix G – Fort Mason Intercept Survey

Appendix H – Wye Terminal Operations Memorandum

SECTION 1.0 INTRODUCTION AND DESCRIPTION OF TASK

This working paper presents a preliminary transit operating plan for the proposed historic streetcar extension to Fort Mason and incorporates the ridership assessment work from Task No. 6. The proposed project would extend streetcar service from the existing F-Market & Wharves line (F-line) at Jefferson & Jones Streets in Fisherman's Wharf to Fort Mason. This extension would extend five blocks west on city streets from a junction with the current F-line alignment at Jefferson and Jones Streets to the San Francisco Maritime National Historical Park (SFMNHP), and then continue on National Park Service property through the Fort Mason Tunnel to the Fort Mason Center. At the proposed terminal at Fort Mason, several alternatives are being considered for a loop or wye turnaround configuration.

Two operating scenarios are considered in this paper for the extension. First, the extension could be operated as an extension of the current F-line, which operates to a terminal in Fisherman's Wharf. This extension could be operated with the F-line as a stand-alone streetcar line, or in combination with a future E-Embarcadero service. The second option would be to operate the extension as an extension of a future E-Embarcadero service, which is a proposed new historic streetcar line that is not yet operational. The San Francisco Municipal Transportation Agency (SFMTA) has proposed to operate a future E-line between the Caltrain Terminal at King & 4th Streets and Fisherman's Wharf along the waterfront, and this line could be extended to Fort Mason, with the F-line continuing to operate to the current terminal in Fisherman's Wharf.

This paper builds on previous work that has been completed by SFMTA staff, and by the project team, including a review of existing and future conditions in the study area (Working Paper #1); development of project alternatives (Working Paper #2); an assessment of current and projected ridership (Working Paper #3); and the Draft Conceptual Design Report. Additionally, the project team met with staff from the SFMTA in November 2007 to discuss the agency's preferred operating scenarios for the streetcar extension. Project team staff also reviewed earlier work by SFMTA staff including the Draft Preliminary Operating Plan for the E-Embarcadero, SFMTA's Short Range Transit Plan, current operating schedules for the F-Market & Wharves line, and ridership reports from SFMTA's Scheduling Department and from the Transit Effectiveness Project (TEP).

These earlier working papers, SFMTA information and information developed in the meeting with SFMTA formed the basis of this preliminary operating plan, including capacity, vehicle requirements, and other service design criteria. Generalized operating and maintenance costs are also discussed in this paper.

SECTION 2.0 CURRENT STREETCAR SERVICE

2.1 F-MARKET AND WHARVES HISTORIC STREETCAR SERVICE

San Francisco's current historic streetcar service is provided by the F-Market and Wharves line, which operates between the outer terminal in the Castro District at 17th Street & Castro and the inner terminal at Jones & Beach Streets in Fisherman's Wharf. The segment of this line between Castro and the Transbay Terminal (at First and Mission Streets) began service in September 1995. Service was extended from Transbay Terminal to Fisherman's Wharf in March 2000.

Between the two terminals noted above, the F-line serves numerous intermediate stops, which are generally spaced every 800-1000 feet along the route. Major stops along Market Street include major transfer points or traffic generators at Church, Valencia, Van Ness, 7th Street, 4th Street, and First Street; Don Chee Way at Steuart Street; multiple stops along The Embarcadero, including the Ferry Building, Broadway, Bay, and Stockton Streets; stops on Jefferson Street and on Beach Street; and the terminal at Jones & Beach Streets (See Figure 1).

In general, except for pull-in and pull-out cars, most trips scheduled to operate on the F-line operate for the full length of the line between the inner and outer terminals. During some periods of high ridership, SFMTA also operates shuttle cars for supplemental service from the Ferry Building to Fisherman’s Wharf. These shuttle cars use the same historic streetcars as are used on the regular service, and are put into operation if regular F-line service becomes bunched or gapped, requiring additional cars to maintain scheduled headways and handle the crowds on the line.

When the current F-line was constructed, the project included the construction of connecting tracks between the F-line tracks on The Embarcadero and the Muni Metro Extension (MMX) tracks further south on The Embarcadero, connecting at Folsom Street. This track connection makes possible future E-Embarcadero service, which would need to transition between the MMX tracks and the F-line tracks for the route planned for the E-line, which is along the entire northern waterfront, from Fisherman’s Wharf to the Caltrain Terminal at Fourth and King. Specific details of the planned future E-line are discussed in Section 3.0.

2.2 DAYS OF OPERATION, SPAN OF SERVICE, AND HEADWAYS

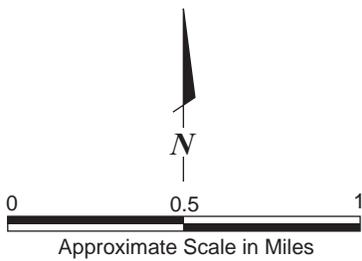
The F-line operates daily from 6:00 a.m. to 12:30 a.m. Tables 1 and 2 show current weekday and weekend headways for the F-line.

Table 1				
Weekday Headways for F-line (Current)				
Time period	6:00 a.m.-9:00 a.m.	9:00 a.m.-4:00 p.m.	4:00 p.m.-6:00 p.m.	6:00 p.m.-12:30 a.m.
Headways	6 minutes	8 minutes	7 minutes	15 minutes

Source: SFMTA, Route description for F-line, Website. <http://www.sfmta.com/cms/asystem/routedesc.php?rted=F>, accessed on January 12, 2009.

Table 2			
Weekend Headways for F-line (Current)			
Time Period	6:00 a.m.-10:00 a.m.	10:00 a.m.-6:00 p.m.	6:00 p.m.-12:30 a.m.
Headways	10 minutes	8 minutes	15 minutes

Source: SFMTA, Route description for F-line, Website. <http://www.sfmta.com/cms/asystem/routedesc.php?rted=F>, accessed on January 12, 2009.



**CURRENT F-MARKET AND WHARVES
HISTORIC STREETCAR LINE**



January 2009
28067144

Transit Operations Plan
Historic Streetcar Extension
San Francisco, California

FIGURE 1

2.3 RUNNING TIMES, OPERATING SPEED, AND ANNUAL VEHICLES MILES AND HOURS

One-way end-to-end running times for the F-line range between 41 minutes and 50 minutes, as shown in Tables 3 and 4. Cycle times, including layover time at the terminals, ranges between 105 minutes and 120 minutes on weekdays, and between 102 minutes and 109 minutes on weekends, also shown in Tables 3 and 4.

	6:00 a.m. – 9:00 a.m.	9:00 a.m. – 4:00 p.m.	4:00 p.m. – 6:00 p.m.	6:00 p.m. – 12:30 a.m.
Outbound	42 minutes	50 minutes	50 minutes	42 minutes
Inbound	41 minutes	41 minutes	48 minutes	44 minutes
Layover	22 minutes	29 minutes	20 minutes	19 minutes
Total Cycle Time	105 minutes	120 minutes	118 minutes	105 minutes

Source: Calculations derived from SFMTA F-line September 2007 rotations.

	6:00 a.m. – 10:00 a.m.	10:00 a.m. – 6:00 p.m.	6:00 p.m. – 12:30 a.m.
Outbound	41 minutes	47 minutes	44 minutes
Inbound	50 minutes	50 minutes	45 minutes
Layover	14 minutes	12 minutes	13 minutes
Total Cycle Time	105 minutes	109 minutes	102 minutes

Source: Calculations derived from SFMTA F-line September 2007 rotations.

The operating speed of the F-line ranges between 3.2 to 12.2 mph (exclusive of layover time), depending on the time of day and direction, as shown in Table 5. The slowest speed segments are the segments in Fisherman’s Wharf, where operations average between 3.2 mph and 5.6 mph, depending on the time of day. These numbers were derived using 2007 schedule information provided by SFMTA.

Table 5
Average Operating Speeds for Segments of F-line (Current)

	Segment distance (miles)	AM Peak (8am trip)	Miles per hour	Midday (1pm trip)	Miles per hour	PM Peak (5pm trip)	Miles per hour	Evening (9pm trip)	Miles per hour	Average speed (mph)
Inbound										
17/Castro - Market/Church	0.5	4	7.5	5	6.0	5	6.0	4	7.5	6.8
Market/Church - Market/Van Ness	0.8	8	5.6	8	5.6	8	5.6	7	6.4	5.8
Market/Van Ness - Market/7th	0.5	4	7.8	5	6.2	5	6.2	4	7.8	7.0
Market/7th - Market/4th	0.5	4	7.7	4	7.7	4	7.7	3	10.2	8.3
Market/4th - Market/1st	0.5	3	10.4	4	7.8	3	10.4	3	10.4	9.8
Market/1st - Steuart/Loop	0.5	4	6.8	5	5.4	5	5.4	4	6.8	6.1
Steuart/Loop - Embr/Stockton	1.5	9	10.2	12	7.7	12	7.7	9	10.2	8.9
Embr/Stockton-Jones/Beach	0.4	6	4.4	7	3.8	7	3.8	4	6.6	4.6
Total	5.2	42	7.5	50	6.3	49	6.4	38	8.2	57.3
Outbound										
Jones/Beach - Beach/Stockton	0.4	4	5.6	7	3.2	6	3.7	6	3.7	4.0
Beach/Stockton - Steuart/Loop	1.6	8	12.2	9	10.9	11	8.9	9	10.9	10.7
Steuart/Loop - Market/Battery	0.6	4	9.0	5	7.2	5	7.2	4	9.0	8.1
Market/Batt - Market/Stockton	0.5	4	7.5	5	6.0	5	6.0	4	7.5	6.8
Market/Stockton - Market/7th	0.5	3	10.2	6	5.1	5	6.1	4	7.7	7.3
Market/7th - Market/Van Ness	0.5	4	7.8	5	6.2	5	6.2	4	7.8	7.0
Market/Van Ness - Market/Church	0.8	4	11.3	5	9.0	6	7.5	5	9.0	9.2
Market/Church - 17th/Noe	0.4	4	6.5	5	5.2	5	5.2	4	6.5	5.8
Total		35	8.9	47	6.7	48	6.5	40	7.8	7.5

Source: Segment run times for F-line No-Build route segments from SFMTA's January 2006 rotations. 2) Extension segment run times from LTK memo 4/22/04 on operations for 2004 Extension Feasibility Study, as modified by email from SFMTA (Ron Niewiarowski) dated 3/1/07. As modified, segment portion from Van Ness Ave to Fort Mason calculated at 17.5 mph by LTK, and segment from Jones St to Van Ness Ave estimated at 5 mph by SFMTA/SFCTA, based on NextBus data for current F-line operating speeds.

2.4 VEHICLE REQUIREMENTS

2.4.1 Cars in Fleet

SFMTA has a large and varied fleet of historic streetcars available to operate the F-line. Vehicles currently used for the F-line consist of 17 single- and double-ended President’s Conference Committee (PCC) streetcars; 10 Peter Witt cars from Milan (Italy), antique streetcars from San Francisco; and streetcars from other countries. See Appendix A for SFMTA Streetcar Fleet Roster from the SFMTA 2008 Short Range Transit Plan. The historic streetcar fleet is usually split into “regular service cars”, of which there are 27 active cars and 11 undergoing rehabilitation, and “special service” cars, of which there are 6. Special service cars are rare one-of-a-kind cars that may not be available for service everyday. Regular service cars are available for service everyday. SFMTA also owns approximately 41 additional historic streetcars that are currently considered inactive, but could be rehabilitated and returned to operating condition at some point in the future.

The current F-line service generates approximately 575,952 annual vehicle miles of service and requires approximately 87,314 annual vehicle hours to operate this streetcar line (calculated based on information in Appendix B).

2.4.2 Current Vehicle Requirements

Table 6 summarizes the F-line’s current peak vehicle demand for service during the weekday. The maximum number of vehicles needed to meet peak demand is 18 vehicles for the morning peak period, plus 2 shuttle cars. When the spare vehicles needed to support this level of service are included at a ratio of 30% spare vehicles, the total number of vehicles needed in the fleet to support the peak vehicle demand is 26 vehicles.

	Cycle time (minutes)	Headways (minutes)	Scheduled Peak Demand Vehicles¹	Shuttle Cars	30% spare	Total Vehicles Required
A.M. Peak	105	6	18	2	6	26
Midday	120	8	15	2	6	23
P.M. Peak	118	7	17	2	6	25
Evening	105	15	7		3	10

¹ San Francisco Municipal Transportation Agency, *Draft Short-Range Transit Plan for 2008-2027*, p. 7-4.

2.5 SCHEDULING AND OPERATIONS

2.5.1 Layovers

All transit line operations require layover periods at either end of the line for schedule recovery and for operator's personal needs. Schedule recovery time is needed in case of delays, so that the vehicle can get back on schedule if one particular trip is delayed due to traffic congestion, problems on the line, or other circumstances which may delay the vehicle. Layover time requirements vary with line length and operating conditions, but are typically 10-20% of the travel time. On the current F-line, layover times range between 20% and 25% of scheduled running time on weekdays, and between 12% and 15% of scheduled running time on weekends.

2.5.2 Control

The F-line operates primarily under traffic signal control, based on the operator's line of sight. Streetcar operators comply with the same traffic signals that drivers of other motorized vehicles do along the route. On The Embarcadero portion of the line, the F-line cars receive priority signaling over private automobiles at some intersections, and at these locations there are transit-only signals that control streetcar movement, coordinated with the traffic signals.

2.6 RIDERSHIP

2.6.1 History of F-line Ridership Development

The F-line first began operation in 1995, operating between the Castro District and the Transbay Terminal, and replacing the 8-Market trolley coach service between the same general points. SFMTA's 1996 Short-Range Transit Plan (SRTP) estimated ridership for the new F-line service to be approximately 8,100 weekday passengers at that time, which is roughly equivalent to the ridership reported in the 1995 SRTP for the 8-line which it replaced. Ridership on the 8-line was reported as 8,017 riders.² SFMTA extended the F-line to serve Fisherman's Wharf in March 2000. At the time of that extension of streetcar service, the F-line replaced the 32-Embarcadero bus line, which had previously operated along The Embarcadero between the Ferry Building and Fisherman's Wharf, with peak hour extensions to the Caltrain Terminal. The 32-line was reported to carry approximately 1,770 daily riders in the 1995 SRTP.³ The 2004 SRTP estimated ridership for the extended F-line to be approximately 20,057 daily passengers⁴, which was approximately a doubling of ridership over the predecessor trolley coach and diesel bus lines on the same general route alignments.

2.6.2 Current Ridership for the F-line

As noted in Section 2.6.1 above, ridership on the route alignment covered by the F-line increased substantially when the line was converted from trolley coach and diesel bus to historic streetcar operation. A summary of historical and recent ridership figures for the F-line is shown in Table 7. In recent years, the F-line ridership has remained much higher than ridership on the

² San Francisco Municipal Transportation Agency, Short-Range Transit Plan, 1995-2004.

³ San Francisco Municipal Transportation Agency, Short-Range Transit Plan, 1995-2004.

⁴ San Francisco Municipal Transportation Agency, Short-Range Transit Plan for 2004-2023.

predecessor bus lines, though reported ridership varies by as much as 6,300 riders a day, depending on when the data collection was performed. These variations may reflect seasonal variations due to the large amount of tourist ridership on the line, or they could reflect different data collection methodologies. For instance, SFMTA reported 16,420 average daily weekday riders (May 2007) for the F-line to the National Transit Database.⁵ SFMTA's Transit Effectiveness Project (TEP) conducted a passenger count survey in the fall of 2006 to spring 2007, which estimated the F-line's average daily weekday ridership to be about 18,520 passengers.⁶ SFMTA staff has also reported that more recent data collection (July 2007) shows current total daily ridership at 22,790.⁷

2.7 CAPACITY AND LOAD FACTORS FOR F-LINE (CURRENT)

Capacity on a transit system is determined by several factors. The vehicle size and configuration determine how many passengers can be carried on each individual car. The operating characteristics of the line determine the ultimate number of riders that can be carried, based on frequency of service (cars per hour) multiplied by the individual car capacity, which yields the overall line capacity.

⁵ Ron Niewiarowski of San Francisco Municipal Transportation Agency, Email correspondence with Duncan Watry of URS Corporation, February 8, 2008.

⁶ San Francisco Municipal Transportation Agency, Transit Effectiveness Project, Fall 2006 - Spring 2007, Website. <http://www.sfmta.com/cms/rtep/tepdataindx.htm>. The TEP data collection methodology represents a departure from SFMTA's historical ridership data collection and is currently under review. While SFMTA is willing to share this data with interested parties, users of this data should understand that the data is still being validated and that the data collection methodology has not been officially endorsed for submission to the Federal Transit Administration's National Transit Database.

⁷ Ron Niewiarowski of San Francisco Municipal Transportation Agency, Email correspondence with Duncan Watry of URS Corporation, February 8, 2008.

Year	Number of Weekday Passengers	Notes
1996	8,100 ⁸	Transbay Terminal to Castro
2004	20,057 ⁹	Extended to Fisherman's Wharf
July 2006	21,324 ¹⁰	--
(Fall 2006- Spring 2007)	18,520 ¹¹	TEP data
May 2007	16,420 ¹²	NTD
Draft July 2007	22,790 ¹³	--

A further consideration is that the number of riders can turn over several times over the course of a transit vehicle's progress over the line, especially on long lines on crowded urban systems. With this situation, a line's capacity can be many times the capacity of the sum of the individual cars operating the line, if riders are boarding and alighting for short trips and the car is filling up several times over. In order to cope with this situation, many transit systems measure ridership at the maximum load point (MLP), which is the point where the highest loads are expected to occur on the line. If the capacity and the average loads at the MLP are known, then the load factors can be calculated for that point, which would indicate if there was enough capacity being provided on the line.

Overall capacity (Table 8) for weekday service on the F-line was calculated to determine the line's current load factors. Load factors for the current service were then calculated using the TEP's preliminary ridership data. This analysis indicates that for most time periods, the current F-line is operating at substantial but not overloaded conditions. During one time period, however, the F-line's vehicles are currently operating over capacity. This time period is for outbound trips during the PM peak hours, when cars are carrying loads of 140% at the MLP. During the midday and afternoon peak periods, cars are operating three-quarters full at the MLP (75% and 84%, respectively), as shown on Table 9.

One important statistic to note is that the peak hour, peak direction (PHPD) ridership, measured at the MLP, is 4% of the daily total ridership. On many transit systems the PHPD figure is

⁸ San Francisco Municipal Transportation Agency, Short-Range Transit Plan, 1996-2005.

⁹ San Francisco Municipal Transportation Agency, Short-Range Transit Plan for 2004-2023.

¹⁰ Ron Niewiarowski of San Francisco Municipal Transportation Agency, Email correspondence with Duncan Watry of URS Corporation, February 8, 2008.

¹¹ San Francisco Municipal Transportation Agency, Transit Effectiveness Project, Fall 2006 - Spring 2007, Website. <http://www.sfmta.com/cms/rtep/tepdataindx.htm>. The TEP data collection methodology represents a departure from SFMTA's historical ridership data collection and is currently under review. While SFMTA is willing to share this data with interested parties, users of this data should understand that the data is still being validated and that the data collection methodology has not been officially endorsed for submission to the Federal Transit Administration's National Transit Database.

¹² Ron Niewiarowski of San Francisco Municipal Transportation Agency, Email correspondence with Duncan Watry of URS Corporation, February 8, 2008.

¹³ Ron Niewiarowski of San Francisco Municipal Transportation Agency, Email correspondence with Duncan Watry of URS Corporation, February 8, 2008.

higher, reflecting systems that are more peaked than the F-line, or which have a high peak-to-base ratio. The F-line carries relatively heavy loads all day, which evens out the peak-to-base ratio, and indicates better utilization throughout the day, thus the PHPD is lower than on many systems. Casual observation of the F-line operation indicates that many cars appear to be overloaded, above and beyond what the ridership calculations would indicate, using the official numbers. This may be the result of bunching and gapping, which causes some cars to overload and others to carry lighter loads than would normally be expected. Casual observation indicates that bunching and gapping is a problem on the current F-line.

	A	B	C	D	E	F	G
Time period	Time duration (hours)	Headway (minutes)	Trips per hour	Trips per time period	Vehicle Capacity	Hourly capacity at MLP (passengers)	Daily capacity at MLP (passengers)
Calculation			60/B	A*C		C*E	A*C
Weekday Inbound							
6:00 a.m. – 9:00 a.m.	3	6	10	30	60	600	1800
9:00 a.m. - 4:00 p.m.	7	8	7.5	53		450	3150
4:00 p.m. - 6:00 p.m.	2	7	8.6	17		514	1029
6:00 p.m. - 12:30 a.m.	6.5	15	4	26		240	1560
Sub-Total				126			1,804
Weekday Outbound							
6:00 a.m. - 9:00 a.m.	3	6	10	30	60	600	1800
9:00 a.m. - 4:00 p.m.	7	8	7.5	53		450	3150
4:00 p.m. - 6:00 p.m.	2	7	8.6	17		514	1029
6:00 p.m. - 12:30 a.m.	6.5	15	4	26		240	1560
Sub-Total				126			1,804
Total				251		3,609	15,077

Table 9
Estimated Weekday Load Factors for F-line (Current)

	During Time Period						
	H	I	J	K	L	M	N
Time Period	Time duration (hours)	Total Number of passengers	Number of passengers on board at MLP	Number of passengers on board per hour at MLP	% of passengers on board per hour at MLP	Hourly capacity at MLP (passengers)	Load Factor (%)
Source or Calculation		TEP data	TEP data	J/H	K/I	F	K/M
Weekday Inbound							
6:00 a.m. – 9:00 a.m.	3	1,851	884	295	16%	600	49%
9:00 a.m. - 4:00 p.m.	7	5,110	2,371	339	7%	450	75%
4:00 p.m. - 6:00 p.m.	2	1,931	860	430	22%	514	84%
6:00 p.m. - 12:30 a.m.	6.5	887	318	49	6%	240	20%
Weekday Outbound							
6:00 a.m. – 9:00 a.m.	3	677	251	84	12%	600	14%
9:00 a.m. – 4:00 p.m.	7	3,793	1,464	209	6%	450	46%
4:00 p.m. – 6:00 p.m.	2	2,676	1,442	721	27%	514	140%
6:00 p.m. – 12:30 a.m.	6.5	1,595	788	121	8%	240	51%

Source: Preliminary ridership numbers from SFMTA TEP for F-line, Winter 2006-07.

SECTION 3.0 PLANNED INITIAL E-EMBARCADERO HISTORIC STREETCAR LINE

The Historic Streetcar Extension project assumes that, in addition to the current F-line operation, that SFMTA would also operate the proposed E-Embarcadero historic streetcar line, and that it would become operational prior to the construction of the Fort Mason extension, with regular daily service between the Caltrain depot and the Jones Street terminal in Fisherman’s Wharf.

3.1 PROPOSED ALIGNMENT

The concept of a streetcar line along the waterfront originated in the late 1970s, and has been carried in various planning documents through the years, including SFMTA’s current Short Range Transit Plan (SRTP)¹⁴, and it is also included as a recommendation for implementation as part of the current TEP project.¹⁵ As envisioned, the proposed E-line would be operated with historic and vintage streetcars between the Caltrain terminal and Jones & Beach Streets in Fisherman’s Wharf, operating via The Embarcadero. Trackage would be shared on the southern portion of Embarcadero with SFMTA’s existing Muni Metro operations and on the northern portion of The Embarcadero with the F-Market and Wharves line.

¹⁴ San Francisco Municipal Transportation Agency, *Short-Range Transit Plan for 2008-2027*, p. 83.

¹⁵ San Francisco Municipal Transportation Agency, *Transit Effectiveness Project – Recommendations*, Website. http://www.sfmta.com/cms/mtepd/documents/Line_E.pdf. Accessed February 5, 2009.

The right-of-way infrastructure needed to operate the basic starter E-line between the Caltrain Terminal and Fisherman’s Wharf currently exists, assuming that the line is operated with double-ended cars on the current trackage and can share a terminal with the N-line at the Caltrain Terminal and the F-line at Jones Street. If SFMTA decides to use single-ended cars on the proposed E-line, a new turning facility would need to be constructed on the southern end of the line at or near the Caltrain terminal. SFMTA prepared a “Preliminary E-Embarcadero Line Operating Plan” for initiating E-line operation in 2000. SFMTA has not yet started operation of the E-line because of the additional operating funds required, and the current shortage of sufficient double-ended vehicles that would be needed to operate this route without a loop terminal on the southern end of the line. This has delayed implementation of the E-line. Extension of the future E-line beyond Jones Street to Fort Mason would require additional construction between Fisherman’s Wharf and Fort Mason Center, which is the subject of the Environmental Impact Statement currently being prepared for the National Park Service (NPS) (See Figure 2).

3.2 IMPLEMENTATION SCHEDULE FOR E-LINE

SFMTA’s FY 2006 SRTP notes that implementation of a basic E-line service with full, 20-hour-a-day operation would require the following components: rehabilitation of additional historic vehicles; identification of operating and capital funding sources; determination of the terminal configuration at the Caltrain terminal; and depending on the level of service, additional capacity at a maintenance facility may be needed. However, the FY 2008-2027 SRTP notes that it is possible to start a limited E-line service with existing double-ended vehicles using the existing tracks and turnaround facilities. The more recent SRTP notes that, pending the availability of sufficient double-ended cars and operating funds, SFMTA’s plan is to initiate 20-hour-a-day E-line service in 2010.¹⁶

3.3 DAYS OF OPERATION, SPAN OF SERVICE, AND HEADWAYS

It is anticipated that the E-line would operate seven days a week, with 15-minute headways during peak and non-peak hours, as shown in Table 10. The span of revenue service is expected to be from approximately 6:00 a.m. to 12:30 a.m., or 18.5 hours per day.

Line	Peak hours	Non-peak hours
E-Embarcadero	15 minutes	15 minutes

3.4 RUNNING TIMES AND OPERATING SPEED

During peak hours, the E-line’s round-trip running time would be approximately 83 minutes. With 20 minutes of layover time included (approximately 25% of scheduled running time), the cycle time would be approximately 103 minutes. The E-line’s average operating speed (including stops) is estimated to be approximately 4.5 miles per hour during peak periods.

¹⁶ San Francisco Municipal Transportation Agency, Short-Range Transit Plan for 2008-2027, p. 83.

3.5 VEHICLE REQUIREMENTS

According to SFMTA's *Draft Preliminary E-Embarcadero Operating Plan* (June 2000), eight vehicles would be needed to meet the E-line peak vehicle demand requirements. Six of these vehicles would be used for service with the remaining two cars as maintenance spares.

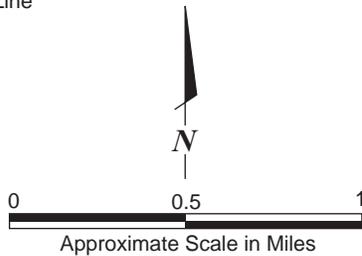
3.6 ANNUAL VEHICLE MILES AND HOURS

The proposed basic E-line is expected to generate 307,775 annual vehicle miles and 39,165 annual vehicle hours calculated based on information in Appendix B.



LEGEND

- Current F-Market and Wharves Line
- - - Future E-Embarcadero Line



CURRENT F-MARKET AND PLANNED INITIAL E-EMBARCADERO HISTORIC STREETCAR LINES



January 2009
28067144

Transit Operations Plan
Historic Streetcar Extension
San Francisco, California

FIGURE 2

SECTION 4.0 PROJECT DESCRIPTION FOR FORT MASON EXTENSION

4.1 PROPOSED ALIGNMENT

The proposed alignment for the Fort Mason streetcar extension was first proposed in the 1980s, and then developed in the 2004 Muni E-line Extension Feasibility Study (Feasibility Study), which was managed by The Presidio Trust and included NPS, Fort Mason Center, and the SFMTA as project partners. The proposed project would extend streetcar service from the current streetcar alignment at Jefferson and Jones west to Fort Mason. The extension would extend on Jefferson between Jones and Leavenworth, then turn south on Leavenworth. At Beach, the proposed project would extend west on Beach Street using a double-track configuration past Polk Street, where it would turn northward onto NPS property. The double-track alignment would then transition between Beach Street and the east portal of the Fort Mason Tunnel through NPS property approximately parallel to Van Ness, switching to single track for the tunnel segment. On the west side of the tunnel, there would be a terminal at Fort Mason. Five alternatives are being considered for terminal configuration. In the eastbound direction, the proposed extension would use the same alignment as the westbound as far as Beach and Leavenworth, and then would extend easterly on Beach, rejoining the existing F-line streetcar trackage at Beach and Jones. The figures in Appendix C each depict the full alignment for the proposed extension, with one of the Fort Mason turnaround options. A turnback switch would be provided at Beach and Leavenworth. The portions of the alignment that are in public street rights-of-way could be configured either in semi-exclusive rights-of-way, or in mixed traffic. A full discussion of the options for the in-street right-of-way configurations is contained in the *Draft Conceptual Engineering Report*, released January 22, 2009.

The proposed alignment requires traversing NPS property between approximately Beach and Polk Streets and the terminal in Fort Mason, including the portion across Van Ness Avenue, through the Fort Mason Tunnel, and into the Fort Mason terminal area. A critical segment is the portion of the alignment known as the “transition”, which is between Beach & Polk and the east portal of the tunnel. Two alignment options for the transition area are shown in Figures 3 and 4. All of the terminal options are on NPS property.

4.2 TURNAROUND AT FORT MASON

Two options for the turnaround at Fort Mason were presented in the 2004 *Feasibility Study*. These options were subsequently modified or expanded to respond to scoping comments from public agencies and neighborhood residents as well as feedback from the project’s Technical Advisory Committee (TAC). Thirteen options were developed for review by the TAC and these were subsequently refined down to five options for more detailed analysis. The resulting five options for the terminal configuration at Fort Mason are described below and detailed drawings are attached in Appendix D. Each of the turnaround options was designed to respond to a specific environmental or operational concern, and illustrate different approaches to terminal location, sizing and operations:

1. North Wye (A.1) – This option would be a wye track north of the existing trackway, extending into the current Fort Mason parking lot. Two platforms would be provided.

This option would require SFMTA operators to reverse ends and perform a backup movement on single-ended cars. No storage track for dead cars would be provided with this option.

2. North Loop (A.2) – This alternative would consist of a loop north of the existing trackway that enters into the parking lot. A drop-off and boarding platform would be situated alongside Building A. A second optional platform could potentially be placed on the loop's eastern side, near the existing east retaining wall. A storage track would be provided extending west from the loop, adjacent to the NPS gate house.
3. South Wye (A.3) – This option would consist of a wye track that extends into the Great Meadow. Two platforms would be provided: The deboarding platform would be located on the westernmost end point of the trackage, and the boarding platform would be on the south leg of the wye. This option would require SFMTA operators to reverse ends and perform a backup movement on single-ended cars. No storage track would be provided with this option. This option would require removal of portions of the existing retaining wall, construction of additional retaining walls, heavy grading of the meadow area, and re-alignment of the existing bicycle/pedestrian path.
4. South Loop (A.4) – This option would consist of a loop south of the existing trackway into the Great Meadow. One boarding platform would be located adjacent and parallel to Laguna Street. Space for vehicle storage would be on a stub track inside the terminal loop.
5. Full Wye (A.5) – This option would extend one of the wye legs in Option 1 south into the Great Meadow area at an angle. Additionally, a second track would be added, parallel to this extended track, for vehicle storage. This option would require SFMTA operators to reverse ends and perform a backup movement on single-ended cars.

All wye options are assumed to be constructed with spring switches in the overhead and back-poling capability, so that operators do not have to reverse poles for the backup movements.

4.3 FORT MASON TUNNEL

The Fort Mason Tunnel is a concrete-lined tunnel that was constructed in 1914, and was operated by the State Belt Railway for active freight service through abandonment in the late 1970s. The tunnel is currently owned by NPS. It runs east-west about 60 feet beneath the upper Fort Mason complex. The tunnel is about 1,500 feet long, 16 feet wide, and 22 feet high at its highest point. Given these parameters, the proposed streetcar extension would run on a single track through the tunnel, requiring signaling and full interlocking of the single track segment.

4.3.1 Signaling and Interlocking for the Tunnel Segment

For the proposed extension, the tunnel would be fully signaled, with the switches at either end and the signals to and from the transition and the terminal fully interlocked. In addition to

interlocking for safety reasons, additional capability would need to be built into the system to control the number of cars allowed west of the tunnel's eastern portal, in order to ensure that more cars did not proceed west through the tunnel than could be handled by the Fort Mason terminal. This could be accomplished through the track circuitry and the logic controlling the signaling and the interlocking for the tunnel.

4.4 TRANSITION SEGMENT

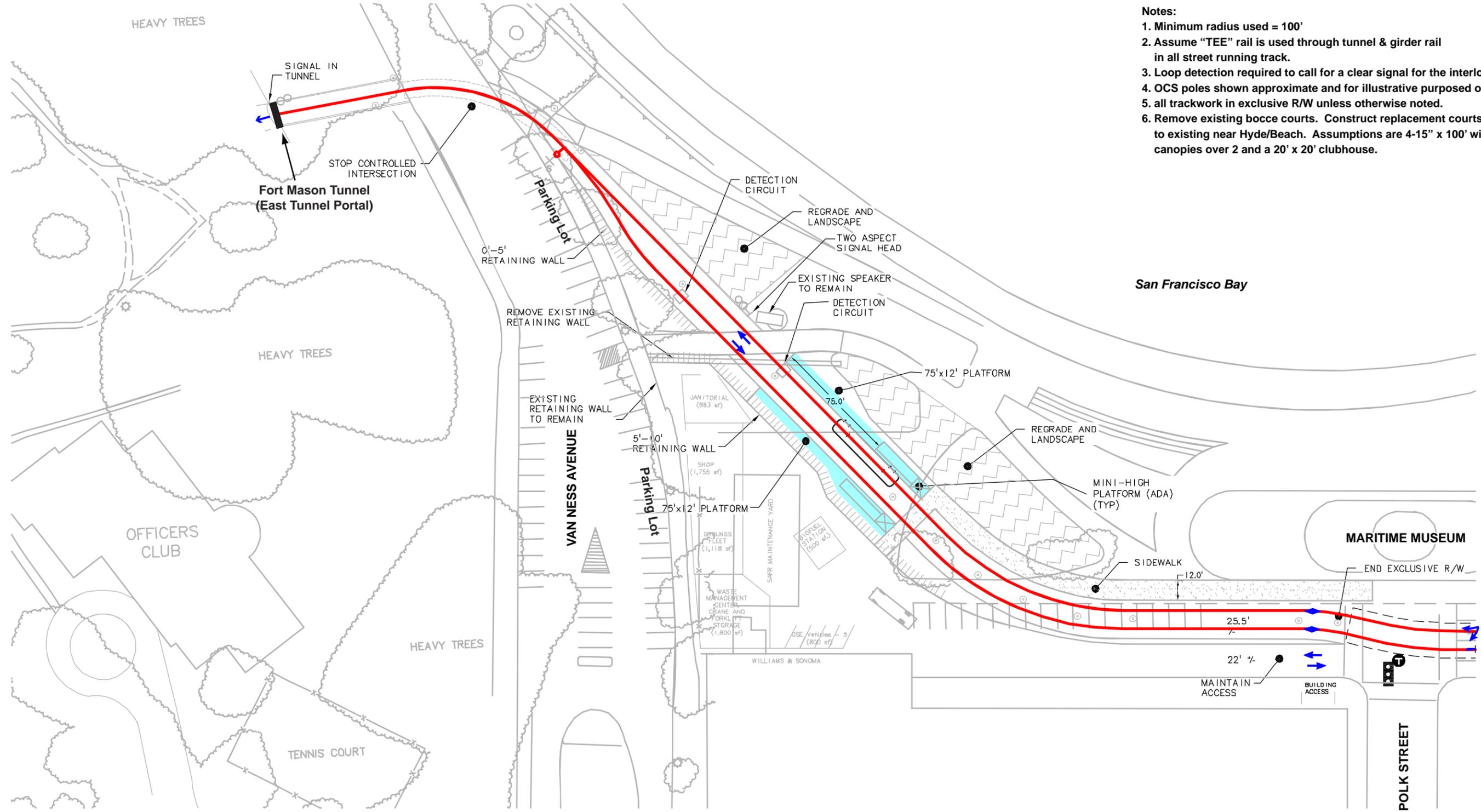
The transition segment of the alignment is located in the area between approximately Beach and Polk and the tunnel's eastern portal (See Figures 3 and 4). The transition segment takes the alignment from the double-track, street-running segment to the east, transitioning to the portion of the alignment on NPS property to the west of Polk Street. A station would be located on the transition segment near the Speaker Tower, and the line would transition from double track to single track between the platforms and the tunnel portal. A track circuit would be placed at the westbound platform for a streetcar to call the signal for the interlocking, so that operation through the single-track tunnel segment could be controlled. A similar circuit would be needed at the west portal of the tunnel also. The working assumption is that signal would serve calls on a first-come, first-served basis, using a directional stick, provided that calls for the westbound movement would be subject to the availability of terminal space at Fort Mason. If two calls are received simultaneously, the eastbound car would be allowed to proceed through the tunnel first, in order to free-up space at the terminal.

In the westbound direction, this circuit would consist of a 20- to 30-foot long section of the west end of the station platform just east of Van Ness. (The first 70 to 80 feet of the platform would be an un signaled operating environment.) After loading at the platform, westbound streetcars would pull forward to an extended portion of the platform with the corresponding track circuit and call for the interlocking signal. The operator would have the option to open the car doors at this point to allow passengers to board or alight while waiting for clearance. Eastbound streetcars would perform a similar maneuver at the western end of the tunnel in order to proceed eastbound.

SFMTA staff considered but ultimately was not in favor of an "advance" signal to alert westbound operators to the approach of an eastbound car at the westbound platform. Instead, SFMTA staff recommended that the westbound platform near Van Ness be moved to the far side of the Van Ness Avenue sidewalk, so that the location where the streetcar would wait could be closer to the end of the double track, and the operator would be able to see the eastbound streetcar exiting the tunnel.

In the eastbound direction, the track circuit used to call the signal would be located as close as possible to the switch to enter the single track, in order to minimize the time between receiving the signal to occupy the single track and actually moving onto the single track segment.

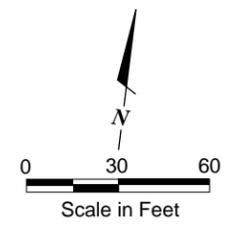
One other issue with the transition segment is the position of the switch from double track to single track relative to the tunnel portal, and the difference in running times for various options. Details of this issue are discussed below in Section 9.6.



- Notes:**
1. Minimum radius used = 100'
 2. Assume "TEE" rail is used through tunnel & girder rail in all street running track.
 3. Loop detection required to call for a clear signal for the interlocking.
 4. OCS poles shown approximate and for illustrative purposes only.
 5. all trackwork in exclusive R/W unless otherwise noted.
 6. Remove existing bocce courts. Construct replacement courts similar to existing near Hyde/Beach. Assumptions are 4-15' x 100' with canopies over 2 and a 20' x 20' clubhouse.

LEGEND

	Proposed Streetcar Alignment		Exclusive Streetcar
	Proposed Retaining Wall		New Traffic Signals
	Turnout		Reconstruct Existing Traffic Signal
	Sidewalk/Path		Transit Phase
	Approximate OCS Pole Location		Streetcar Direction
	Shared with Autos		



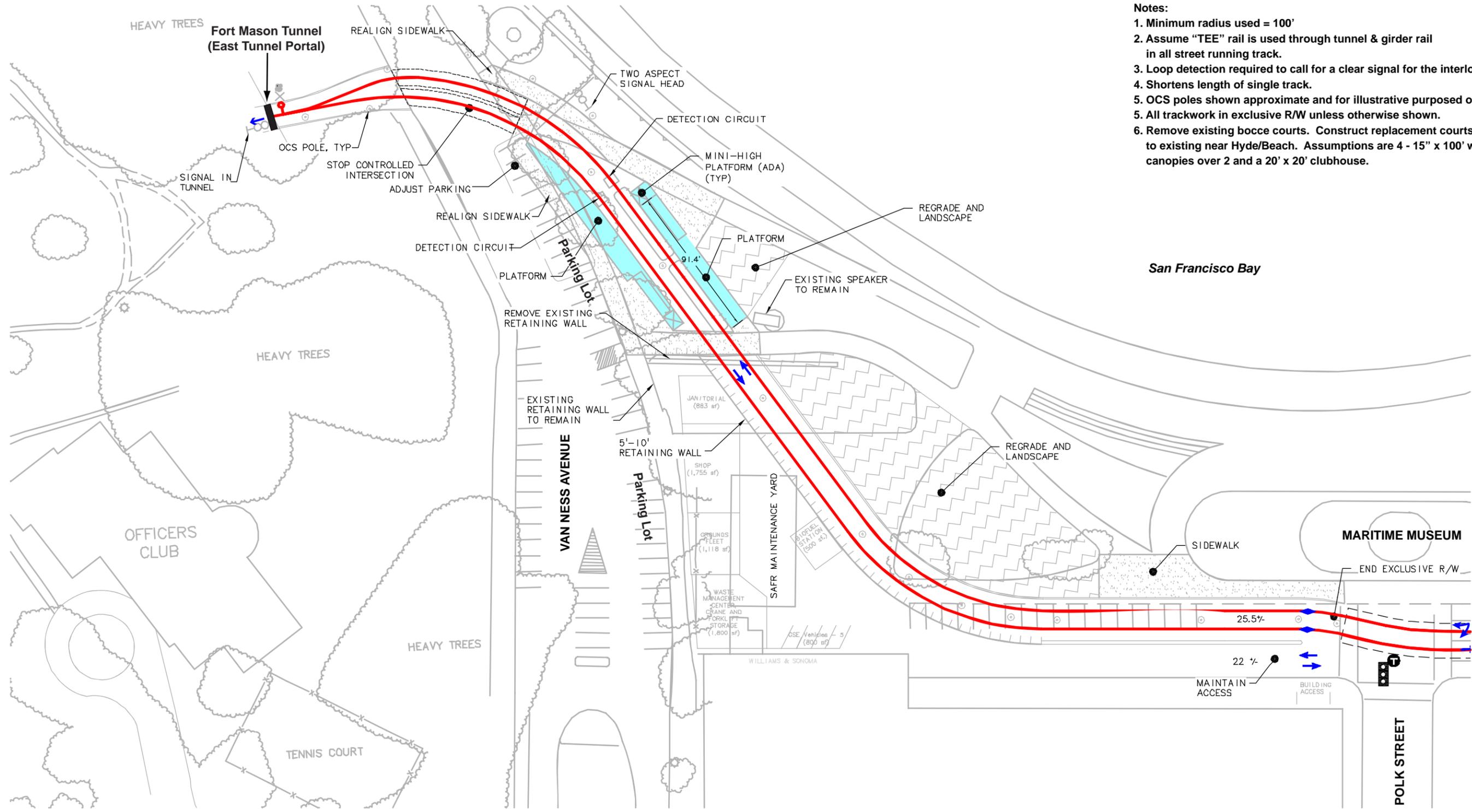
TRANSITION 1 OF 2

Transit Operations Plan
January 2009
28067144

Historic Streetcar Extension
San Francisco, California



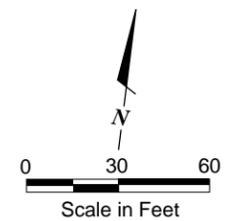
FIGURE 3



- Notes:**
1. Minimum radius used = 100'
 2. Assume "TEE" rail is used through tunnel & girder rail in all street running track.
 3. Loop detection required to call for a clear signal for the interlocking.
 4. Shortens length of single track.
 5. OCS poles shown approximate and for illustrative purposes only.
 5. All trackwork in exclusive R/W unless otherwise shown.
 6. Remove existing bocce courts. Construct replacement courts similar to existing near Hyde/Beach. Assumptions are 4 - 15' x 100' with canopies over 2 and a 20' x 20' clubhouse.

LEGEND

	Proposed Streetcar Alignment		Exclusive Streetcar
	Proposed Retaining Wall		New Traffic Signals
	Turnout		Reconstruct Existing Traffic Signal
	Sidewalk/Path		Transit Phase
	Approximate OCS Pole Location		Streetcar Direction
	Shared with Autos		



TRANSITION 2 OF 2

Transit Operations Plan
January 2009
28067144

Historic Streetcar Extension
San Francisco, California

FIGURE 4



4.4.1 Signaling and Interlocking to Control Total Number of Cars West of East Portal

As noted above, the interlocking system will need to employ logic that can track the number of cars at the Fort Mason terminal, and not allow additional westbound cars to enter the single track if the terminal is full. Track circuits with a directional stick could be used, but SFMTA staff felt this may limit operations in one direction if streetcars are bunched. SFMTA staff stated a preference to install multiple track circuits at the Fort Mason terminal to indicate occupancy and not allow additional westbound cars through the tunnel if all circuits were occupied. A wheel or axle counter would be another option, but was not recommended by SFMTA staff.

4.5 STREET RUNNING SEGMENT

Two options have been proposed for the street running segment between the vicinity of Beach and Polk Streets and the existing streetcar terminal at Jones Street. One option consists primarily of shared auto/streetcar operation in mixed-traffic, and a second option consists of semi-exclusive operation for the eastbound alignment and shared mixed-traffic operation for the westbound alignment. Both configurations have been evaluated for this segment. There are portions of the shared option that contain semi-exclusive operations along Jefferson. It is possible to create a hybrid of the two options having some semi-exclusive and some shared for the eastbound alignment. However, for the purpose of this study, the shared and semi-exclusive options have been evaluated separately. For more detail on the design for these segments of the alignment, see the *Draft Conceptual Engineering Report*, issued January 2009. The Draft Conceptual Engineering Report also contains an analysis of a proposal to place the alignment configuration in semi-exclusive trackway on Beach Street in both directions. This configuration option is not being pursued due to physical constraints that limit the ability to implement such a configuration.

4.5.1 Shared Auto/Streetcar Option

This segment option extends from the transition area at Beach Street and Polk Street easterly to Beach Street and Jones Street where it connects with the existing F-line. The westbound alignment diverges northerly on Leavenworth Street to Jefferson Street. At Jefferson Street, the westbound alignment turns easterly and continues in semi-exclusive right-of-way easterly to Jones Street, where it connects with the existing F-line. On Jefferson Street between Taylor Street and Jones Street, the existing F-line is realigned away from the curb lane and into the current first travel lane, which is reconfigured as a semi-exclusive streetcar lane. Both the current F-line and the proposed Fort Mason extension share trackage on single track for this block, with a switch close to the Jones Street intersection for diverging movements.

4.5.2 Semi-Exclusive Eastbound Option

This segment option extends from the transition area at Beach and Polk Streets easterly along Beach Street to Jones Street where it connects with the existing F-line. The eastbound track is configured in semi-exclusive right-of-way between Polk Street and Jones Street, largely configured as a semi-exclusive curb track lane, similar to the existing F-line trackage on Beach Street east of Jones Street. The westbound alignment is configured in shared right-of-way on Beach Street between Polk Street and Leavenworth Street, and on Leavenworth Street between

Beach Street and Jefferson Street. On Jefferson Street, the westbound alignment is configured in semi-exclusive right-of-way between Leavenworth Street and Jones Street, where it crosses the existing F-line track. There is a diamond crossing of the Fort Mason extension with the existing F-line trackage in the intersection of Jefferson Street and Jones Street. East of Jones Street, the proposed Fort Mason extension is located in the adjacent travel lane to the existing F-line track for approximately 1 block east of Jones Street where the two alignments converge. The existing F-line trackage remains in semi-exclusive right-of-way, and the second track lane is also configured as semi-exclusive right-of-way.

SECTION 5.0 OPERATING SCENARIOS FOR EXTENSION – TWO SERVICE PLAN OPTIONS

The track configuration that currently exists on The Embarcadero allows two alternatives to be considered for historic streetcar service to Fort Mason. The following section presents operating scenarios for two service plan options that include a streetcar extension to Fort Mason. Both scenarios assume that the basic E-line service from Caltrain terminal station to Fisherman’s Wharf (Jones Street) would be operational at the time that one of the extension options would be implemented.

Option 1: E-line Service to Fort Mason and F-line Service to Fisherman’s Wharf – This alternative would include an E-line route between the Caltrain Depot, Fisherman’s Wharf, and Fort Mason, extending the proposed future E-line as the line that would serve Fort Mason. The existing F-line route would be unchanged from the current operation.

Option 2: E-line Service to Fisherman’s Wharf and F-line Extension to Fort Mason – This alternative would include an E-line route between the Caltrain Depot and Fisherman’s Wharf, generally known as the basic E-line. The F-line would be extended from its existing terminal at Fisherman’s Wharf to Fort Mason via the extension.

5.1 OPTION 1 – E-LINE EXTENSION TO FORT MASON AND CURRENT F-LINE SERVICE

5.1.1 Days of Operation, Span of Service, and Headways

In Option 1, the E-line would operate service between the Caltrain Depot and Fort Mason seven days a week, with 15-minute headways at all times. The span of revenue service would be from 6:00 a.m. to 12:30 a.m. In this option, the F-line would operate as it does today between the Castro District and Fisherman’s Wharf. Table 11 shows the headways for the two lines in this option.

Table 11 2030 Headways for Option 1				
Line	6:00 a.m.-9:00 a.m.	9:00 a.m.-4:00 p.m.	4:00 p.m.-6:00 p.m.	6:00 p.m.-12:30 a.m.
E-Embarcadero (Caltrain Depot to Fort Mason) - Daily	15 minutes	15 minutes	15 minutes	15 minutes
F-Market (Castro to Fisherman's Wharf) - Weekday	6 minutes	8 minutes	7 minutes	15 minutes
Line	6:00 a.m.-10:00 a.m.	10:00 a.m.-6:00 p.m.		6:00 p.m.-12:30 a.m.
F-Market (Castro to Fisherman's Wharf) - Weekend	10 minutes	8 minutes		15 minutes

5.1.2 Operating Speed, Running Times, and Annual Vehicles Miles and Hours

The proposed extension of the future E-line from Fisherman's Wharf to Fort Mason is approximately 0.85 miles in length. The cycle time assumed for the basic E-line is 87 minutes, and the additional running time for the extension would result in a total cycle time of 103 minutes for the E-line, as shown in Table 12. The average operating speed would be approximately five miles per hour. Operation of the E-line with the extension to Fort Mason would generate approximately 390,302 annual vehicle miles and 46,387 annual vehicle hours, (calculated based on information in Appendix B).

The operating plan for the F-line would not change in this option, thus the anticipated operating speed, running times, and annual vehicles miles and hours for the F-line would remain the same as current. See Section 2.0 for current F-line service plan.

Table 12 2030 Cycle Times for E-line with Extension to Fort Mason (Option 1)		
	Weekdays	Weekends
Cycle time from Caltrain to Fisherman's Wharf	87 minutes	87 minutes
Extension to Fort Mason	16 minutes	16 minutes
Total Cycle Time	103 minutes	103 minutes

5.1.3 Vehicle Requirements

As shown in Table 13, the E-line service in Option 1 would require 7 streetcars to operate between the Caltrain Terminal and Fort Mason, with 3 cars as spares, for a total of 10 cars. This

projected vehicle demand includes a 30% spare ratio. This is 10 more vehicles than SFMTA currently operates for the F-line, and 2 more than required for the basic E-line.

Vehicle requirements for the F-line under this scenario would remain the same as current (as summarized in Table 6), as it would be operating the same route and headways as it currently does. See Section 2.4.2 for current F-line car requirements.

	Cycle time (minutes)	Headways (minutes)	Vehicles Needed (1)	30% spare	Total Vehicles Required
AM Peak	103	15	7	3	10
Midday	103	15	7	3	10
PM Peak	103	15	7	3	10
Evening	103	15	7	3	10

(1) The number of vehicles needed was obtained by dividing cycle time by headway.

5.1.4 2030 Capacity for E-line in Option 1

Capacity estimates at the MLP for the E-line service from the Caltrain Depot to Fort Mason are shown in Table 14. Given 15-minute headways and a vehicle capacity of 60 passengers, it is expected that the E-line would have an hourly capacity of 240 passengers at the MLP in each direction and a total daily capacity of 9,120 passengers at the MLP for both directions.

5.1.5 2030 Capacity for F-line in Option 1

Anticipated capacity at the MLP for the F-line in 2030 at the MLP is presented in Table 15 below. In this option, the F-line would have a daily capacity at the MLP of 15,317 riders per day for both directions. Peak hour, peak direction capacity would be 600 riders per hour at the MLP in the AM Peak and 514 riders per hour in the PM peak.

5.2 OPTION 2 – E-LINE SERVICE TO FISHERMAN’S WHARF AND F-LINE EXTENSION TO FORT MASON

5.2.1 Days of Operation, Span of Service, and Headways

In this scenario, the E-line would operate seven days a week between the Caltrain Depot and Jones Street in Fisherman’s Wharf, with 15-minute headways during peak and non-peak hours. The span of revenue service is expected to be from approximately 6:00 a.m. to 12:30 a.m.

The F-line would operate the proposed F-line extension to Fort Mason, and would operate from approximately 6:00 a.m. to 12:30 a.m., seven days a week. As shown in Table 16, this line’s headways would be similar to current headways. During the weekdays, the line would operate on 6 minute headways from 6:00 a.m. to 9:00 a.m.; 8 minutes from 9:00 a.m. to 4:00 p.m.;

7 minutes from 4:00 p.m. to 6:00 p.m.; and 15 minutes from 6:00 p.m. to 12:30 a.m. During the weekends, the line would operate on 10 minute headways from 6:00 a.m. to 10:00 a.m., 8 minutes from 10:00 a.m. to 6:00 p.m., and 15 minutes from 6:00 p.m. to 12:30 a.m.

Table 14
2030 Weekday Capacity for E-line with Extension to Fort Mason (Option 1)

	A	B	C	D	E	F	G
Time period	Time duration (hours)	Headway (minutes)	Trips per hour	Trips per time period	Vehicle Capacity	Hourly capacity at MLP (passengers)	Daily capacity at MLP (passengers)
Calculation			60/B	A*C		C*E	A*F
Weekday Inbound							
6:00 a.m.-9:00 a.m.	3	15	4	12	60	240	720
9:00 a.m.-4:00 p.m.	7	15	4	28		240	1,680
4:00 p.m.-6:00 p.m.	2	15	4	8		240	480
6:00 p.m.-12:30 a.m.	7	15	4	28		240	1,680
Sub-Total				76		960	4,560
Weekday Outbound							
6:00 a.m.-9:00 a.m.	3	15	4	12	60	240	720
9:00 a.m.-4:00 p.m.	7	15	4	28		240	1,680
4:00 p.m.-6:00 p.m.	2	15	4	8		240	480
6:00 p.m.-12:30 a.m.	7	15	4	28		240	1,680
Sub-Total				76		960	4,560
Total				152		1,920	9,120

5.2.2 Operating Speed, Running Times, and Annual Vehicles Miles and Hours

The proposed extension from Fisherman’s Wharf to the Fort Mason Center is approximately 0.85 miles long, which would add approximately 16 minutes to the F-line’s current cycle times. As noted in Table 17 and 18, this would increase the F-line’s longest cycle time from 120 to 136 minutes for weekday operation and 109 to 125 minutes during the weekend. Operation of this streetcar line with its extension would generate approximately 623,025 annual vehicle miles and 98,956 annual vehicle hours (calculated based on information in Appendix B).

5.2.3 Vehicle Requirements

The E-line would require six vehicles for both the morning and afternoon peak periods in Option 2, with two additional vehicles as maintenance spares, for a total of eight cars required.

For the F-line in this scenario, 28 vehicles would be required, with 21 vehicles for revenue service and 7 maintenance spare vehicles available. See Table 19 for a summary of vehicle

requirements by time of day. In the future peak vehicle demand scenarios, current F-line shuttle cars are assumed to be replaced by E-line cars.

Table 15
2030 Weekday Capacity for F-line to Fisherman's Wharf (Option 1)

	A	B	C	D	E	F	G
Time period	Time duration (hours)	Headway (minutes)	Trips per hour	Trips per time period	Vehicle Capacity	Hourly capacity at MLP (passengers)	Daily capacity at MLP (passengers)
Calculation			60/B	A*C		C*E	A*F
Weekday Inbound							
6:00 a.m.-9:00 a.m.	3	6	10	30	60	600	1,800
9:00 a.m.-4:00 p.m.	7	8	7.5	53		450	3,150
4:00 p.m.-6:00 p.m.	2	7	8.6	17		514	1,029
6:00 p.m.-12:30 a.m.	7	15	4	28		240	1,680
Sub-Total				128		1,804	7,659
Weekday Outbound							
6:00 a.m.-9:00 a.m.	3	6	10	30	60	600	1,800
9:00 a.m.-4:00 p.m.	7	8	7.5	53		450	3,150
4:00 p.m.-6:00 p.m.	2	7	8.6	17		514	1,029
6:00 p.m.-12:30 a.m.	7	15	4	28		240	1,680
Sub-Total				128		1,804	7,659
Total				255		3,609	15,317

Line	6:00 a.m.-9:00 a.m.	9:00 a.m.-4:00 p.m.	4:00 p.m.-6:00 p.m.	6:00 p.m.-12:30 a.m.
E-Embarcadero (Caltrain Depot to Fisherman's Wharf) - Daily	15 minutes	15 minutes	15 minutes	15 minutes
F-Market (with extension to Fort Mason) - Weekday	6 minutes	8 minutes	7 minutes	15 minutes
Line	6:00 a.m.-10:00 a.m.	10:00 a.m.-6:00 p.m.		6:00 p.m.-12:30 a.m.
F-Market (with extension to Fort Mason) - Weekend	10 minutes	8 minutes		15 minutes

	6:00 a.m.-9:00 a.m.	9:00 a.m.-4:00 p.m.	4:00 p.m.-6:00 p.m.	6:00 p.m.-12:30 a.m.
Current Cycle Time	105 minutes	120 minutes	118 minutes	105 minutes
Extension Cycle	16 minutes	16 minutes	16 minutes	16 minutes
Total Cycle Time	121 minutes	136 minutes	134 minutes	121 minutes

	7:00 a.m.-10:00 a.m.	10:00 a.m.-6:00 p.m.	6:00 p.m.-12:30 a.m.
Current Cycle Time	105 minutes	109 minutes	102 minutes
Extension Cycle	16 minutes	16 minutes	16 minutes
Total Cycle Time	121 minutes	125 minutes	118 minutes

	Cycle time (minutes)	Headways (minutes)	Vehicles Needed ¹	30% spare	Total Vehicles Required
AM Peak	121	6	21	7	28
Midday	136	8	17	6	23
PM Peak	134	7	20	6	26
Evening	121	15	9	3	12

Note 1 – Shuttle cars in current F-line peak vehicle demand are assumed in the future scenarios to be replaced by the E-line cars.

5.2.4 2030 Capacity for F-line in Option 2

Capacity calculations for the F-line route with service to Fort Mason are shown in Table 20. At the proposed headways and a vehicle capacity of 60 passengers, it is expected that the F-line in this scenario would have an hourly capacity of 600 passengers at the MLP in each direction for the peak hour and a daily capacity of 15,317 passengers at the MLP in both directions.

5.2.5 2030 Capacity for E-line in Option 2

As shown in Table 21, capacity estimates are lower for the E-line than those for the F-line in Option 2, given the E-line's less frequent service. At the 15-minute headways and a vehicle capacity of 60 passengers, it is expected that the E-line's hourly capacity in this scenario would be 240 passengers at the MLP in each direction and that daily capacity would be 9,120 passengers at the MLP for both directions.

5.3 RIDERSHIP AND LOAD FACTORS

To estimate future ridership and determine estimated future load factors, initial travel demand modeling to determine the baseline future demand was performed by the San Francisco County Transportation Authority (SFCTA) using the service plan shown in Appendix E. Ridership modeling estimates used in the SFCTA Model Runs for the 2030 No Build, 2030 F-line Extension and 2030 E-line Extension scenarios are considered the baselines for this project.

Given that the current F-line has a high component of seasonal ridership based on visitor-generated demand for trips to Fisherman's Wharf, additional calculations were performed to determine current seasonal variations on the F-line, and to apply elasticities resulting from those calculations to the SFCTA baseline estimates to estimate future high season ridership.

5.3.1 Running Times

The running times used to develop the ridership assumptions for the E-line were based on running times for the E-line 2030 No-Build route segments from the SFMTA's *Preliminary E-Embarcadero Line Operating Plan* (June 30, 2000) and normalized to match the F-line No-Build segment run times on common segments. The running times were also based on modified 2030 E-line Extension to Fort Mason run times, which estimated the E-line would travel at 17.5 mph along the segment portion from Van Ness Avenue to Fort Mason and travel at 5 mph along the segment from Jones Street to Van Ness Avenue. For a summary of weekday running times and modified assumptions for the E-line, see Appendix E – Attachment B-1.

The running times used to develop the ridership assumptions for the F-line were based on run times for the F-line 2030 No-Build route segments from the SFMTA's January 2006 rotations and from modified 2030 F-line Extension to Fort Mason run times. The modified run times estimated the F-line would travel at 17.5 mph along the segment portion from Van Ness Avenue to Fort Mason and travel at 5 mph along the segment from Jones Street to Van Ness Avenue. For a summary of weekday running times and modified assumptions for the F-line, see Appendix E – Attachment B-2.

Table 20 2030 Weekday Capacity for F-line (With Extension to Fort Mason)							
	A	B	C	D	E	F	G
Time period	Time duration (hours)	Headway (minutes)	Trips per hour	Trips per time period	Vehicle Capacity	Hourly capacity at MLP (passengers)	Daily capacity at MLP (passengers)
Calculation			60/B	A*C		C*E	A*C
Weekday Inbound							
6:00 a.m.–9:00 a.m.	3	6	10	30	60	600	1,800
9:00 a.m.–4:00 p.m.	7	8	7.5	53		450	3,150
4:00 p.m.–6:00 p.m.	2	7	8.6	17		514	1,029
6:00 p.m.–12:30 a.m.	7	15	4	28		240	1,680
Sub-Total				128		1,804	7,659
Weekday Outbound							
6:00 a.m.–9:00 a.m.	3	6	10	30	60	600	1,800
9:00 a.m.–4:00 p.m.	7	8	7.5	53		450	3,150
4:00 p.m.–6:00 p.m.	2	7	8.6	17		514	1,029
6:00 p.m.–12:30 a.m.	7	15	4	28		240	1,680
Sub-Total				128		1,804	7,659
Total				255		3,609	15,317

5.3.2 Current Load Factors

Current F-line weekday ridership load factors were developed based on ridership data from the SFMTA’s Transit Effectiveness Program (TEP). According to the TEP stop-by-stop data for Winter 2006/07, the MLP for the F-line occurs during the outbound PM peak period at the Embarcadero and Green Street stop. There are 721 passengers per hour are onboard during the peak hour for the peak direction (PHPD), for a current load factor of 145% during high season. The number of riders at the MLP for the PHPD represents 4% of total weekday passenger boardings over the entire line. To determine the number of riders onboard at the MLP during the May 2007 and July 2007 TEP data collection periods, this 4% assumption was applied to the respective weekday passenger boarding totals provided by SFMTA for these other dates. This yielded the load factor estimates for the current F-line shown in Table 22.

The current F-line experiences a high level of ridership by tourists and other seasonal riders. In order to ascertain the ridership differential between low season ridership and high season ridership, the July 2007 TEP total was compared with the May 2007 TEP total, assuming these figures represented respective high and low season numbers. The differential between them was

139%, which is used to provide an elasticity factor for future ridership estimates to provide an assumption of potential seasonal ridership variation.

	A	B	C	D	E	F	G
Time period	Time duration (hours)	Headway (minutes)	Trips per hour	Trips per time period	Vehicle Capacity	Hourly capacity at MLP (passengers)	Daily capacity at MLP (passengers)
Calculation			60/B	A*C		C*E	A*C
Weekday Inbound							
6:00 a.m.–9:00 a.m.	3	15	4	12	60	240	720
9:00 a.m.–4:00 p.m.	7	15	4	28		240	1,680
4:00 p.m.–6:00 p.m.	2	15	4	8		240	480
6:00 p.m.–12:30 a.m.	7	15	4	28		240	1,680
Sub-Total				76		960	4,560
Weekday Outbound							
6:00 a.m.–9:00 a.m.	3	15	4	12	60	240	720
9:00 a.m.–4:00 p.m.	7	15	4	28		240	1,680
4:00 p.m.–6:00 p.m.	2	15	4	8		240	480
6:00 p.m.–12:30 a.m.	7	15	4	28		240	1,680
Sub-Total				76		960	4,560
Total				152		1,920	9,120

	MLP (1) - Peak Hour Peak Direction (2)					
	Total Number of Riders	% of Total Riders	Number of Riders	Capacity	Load Factor	Seasonal Difference
F-line - Current						
TEP Winter 2006-07 data	18,520	4%	721	600	120%	
TEP May 2007 data	16,420	4%	657	600	110% (est)	
TEP July 2007 data	22,790	4%	912	600	152% (est)	139%

(1) The MLP is assumed to be at Embarcadero and Green

(2) The assumed maximum load time period and direction is the outbound pm peak period

**Table 23
2030 Weekday Future Load Factor Projections**

	Total Number of Riders	Seasonal Adjustment	MLP (1) - Peak Hour Peak Direction (2)			
			% of Total Riders	Number of Riders	Capacity	Load Factor
F-line - Future						
SFCTA 2030 Model (low season)	22,561	--	4%	902	600	150%
Projected 2030 (high season) (3)	31,360	139%	4%	1254	600	209%
E-line - Future						
SFCTA 2030 Model (low season)	8,161	--	4%	326	280	117%
Projected 2030 (high season) (3)	11,344	139%	4%	454	280	162%

(1) The MLP is assumed to be at Embarcadero and Green

(2) The assumed maximum load time period and direction is the outbound pm peak period

(3) Project 2030 high season estimate is based on the SFCTA estimate with a 139% seasonal adjustment factor applied

5.3.3 Future Load Factor Estimates

Future ridership estimates and load factors were derived by first running the SFCTA travel demand model for the year 2005 and also for the future year 2030, using the service assumptions shown in Appendix E – Attachment C-1 and C-2 (for the E-line) and Appendix E – Attachment C-3 and C-4 (for the F-line). This exercise resulted in future ridership estimates of 8,161 average weekday riders for the E-line if it were to be extended to Fort Mason, or 22,561 average weekday riders for the F-line, if it were to be extended to Fort Mason. It was assumed that these figures would represent low-season ridership, therefore the 139% seasonal adjustment factor derived in Table 22 was applied to both the extended E-line and the extended F-line figures, to adjust the ridership estimates higher to account for seasonal and visitor ridership. The results of this are shown above in Table 23.

The next step was to estimate low and high season future weekday MLP scenarios. In Section 5.3.2, it was demonstrated the 4% of total daily ridership is onboard the current F-line during the peak hour, peak direction (PHPD) at the MLP. The same 4% factor was applied to the totals from the SFCTA model, and this resulted in the projected future high season load factors shown in Table 23, which are 209% for the F-line, and 162% for the E-line in high season. It was assumed that the future MLP would also occur during the outbound PM peak period and be located at the Embarcadero and Green stop. Peak hour load factors of this magnitude may indicate the need for additional peak hour service to handle the projected loads. This could be done by scheduling more trips per hour, or moving to higher capacity equipment. For instance, scheduling the future F-line at every 6 minutes in the PM peak instead of every 7 minutes would reduce the load factor from 209% to 179%. Scheduling the F-line at every 5 minutes would reduce it further to 149%, which is in the current load factor range. Increasing frequencies would require additional operating funding and additional cars to be available for peak demand.

5.3.4 Stop-by-Stop Ridership

The stop-by-stop ridership estimates from the SFCTA model for the two options for the E-line or F-line extensions to Fort Mason for the year 2030 are shown in Table 24. This table presents the total extension stop activity (inbound direction, outbound direction, and total in both directions) and summarizes the differences in new ridership between Option 1, in which the future E-line would be extended to Fort Mason, and Option 2, in which the F-line would be extended to Fort Mason.

When taking into account travel in both directions, the F-line is projected in the model to have 5,295 more daily riders than the E-line on the extension. It is estimated that the F-line extension would have approximately 353 more riders than the E-line at the Aquatic Park stop and 894 more riders than the E-line at the Laguna/Marina stop at Fort Mason. At the Jefferson/Leavenworth stop, there would be 1,917 more F-line riders than E-line riders. At the Hyde/Beach stop, there would be 2,131 more riders on the F-line than on the E-line. Thus, it appears from the SFCTA model data that extending the F-line to Fort Mason would yield higher ridership on the extension and to Fort Mason than extending the future E-line.

Inbound	Option 1- E-line Extended			Option 2 - F-line Extended			Difference
	On	Off	Total	On	Off	Total	
Jefferson/Leavenworth	0	18	18	0	1935	1935	1917
Hyde/Beach	17	42	59	44	150	194	135
Aquatic Park	5	92	97	37	208	245	148
Laguna/Marina	0	411	411	0	912	912	501
Total Extension Stop Activity	22	563	585	81	3205	3286	2701
Outbound	Option 1- E-line Extended			Option 2 - F-line Extended			Difference
	On	Off	Total	On	Off	Total	
Laguna/Marina	293	0	293	686	0	686	393
Aquatic Park	121	3	124	306	23	329	205
Hyde/Beach	46	12	58	2020	34	2054	1996
Total Extension Stop Activity	460	15	475	3012	57	3069	2594
Total Both Directions	Option 1- E-line Extended			Option 2 - F-line Extended			Difference
	On	Off	Total	On	Off	Total	
Jefferson/Leavenworth	0	18	18	0	1935	1935	1917
Hyde/Beach	63	54	117	2064	184	2248	2131
Aquatic Park	126	95	221	343	231	574	353
Laguna/Marina	293	411	704	686	912	1598	894
Total Extension Stop Activity	482	578	1060	3093	3262	6355	5295

A summary of the projected load factors for the E-line and F-line on the extension based on the ridership data above is shown in Table 25. The number of additional riders at the PHPD MLP for just the extension is approximately 42 riders on the E-line and 254 riders on the F-line. This

load factor analysis assumes a Peak Period Load Factor goal of 85%¹⁷ based on a vehicle capacity of 70 riders and a total of 4 peak cars per hour for the E-line and 10 peak cars per hour for the F-line.

	E	F
PHPD MLP Riders (4% of daily total)	42.4	254.2
Peak Cars/Hour	4	10
Riders/Trip	10.6	25.4
Capacity/Trip (85% of 70)	60	60
Load Factor	0.18	0.43

5.3.5 Cumulative Effect

The cumulative effect of ridership on the two lines is summarized in Table 26, which provides a comparison of the overall ridership based on SFCTA Model totals for the E-line and F-line under current F-line conditions (2005), 2030 No Project, 2030 E-line to Fort Mason, F-line to Fisherman’s Wharf, and 2030 F-line to Fort Mason and E-line to Fisherman’s Wharf scenarios.

SFCTA Model Totals	2005	2030 No Project	2030 E-line to Fort Mason, F-line to Fisherman's Wharf	2030 F-line to Fort Mason, E-line to Fisherman's Wharf
E	-	6,951	8,161	6,552
F	18,581	17,238	17,023	22,561
Total	18,581	24,189	25,184	29,113
Ridership Above Current (modeled)	0	5,608	6,603	10,532
Ridership above No Project			995	4,924
Ridership difference if F extended instead of E				3,929

All three future scenarios (No Project, E-line extension or F-line extension) are estimated to result in higher ridership than the F-line currently handles. Both options for the extension are estimated to result in higher ridership than the No Project scenario. In terms of overall historic streetcar ridership systemwide, the F-line extension to Fort Mason is estimated to result in higher overall historic streetcar ridership than extending the future E-line. The ridership differential shown in Table 26 is lower than the ridership differential shown in Table 24 for the extension only, because not all trips on the extension are new trips to the historic streetcar lines. Some

¹⁷ San Francisco Municipal Transportation Agency, Short-Range Transit Plan for 2008-2027, p. 54.

trips included in the extension estimates are trips that were previously being made to stops on the pre-existing portions of the lines.

5.3.6 Comparison of Transit Trips with Other Modes (All Trips)

A comparison of the daily person trips to Fort Mason and Maritime Park by mode (auto, transit, walking, bike) under the Year 2005 (base year) and Year 2030 (No Project, E-line extension and F-line extension) scenarios is presented in Table 27. The table also compares the percent change in daily person trips of the Year 2030 scenarios to the base year scenario. The trips within the project area are based on the origin and destination data established in the SFCTA travel demand model and represents trips to and from the project area, which is represented within the model's Maritime Park and Fort Mason districts.

This analysis shows that under the No Project scenario, the number of daily person trips (for all modes) will increase into the study area from Year 2005 levels and result in a 15.5% increase in daily transit trips to Maritime Park and an 8.3% increase to Fort Mason. Under the E-line and F-line extension scenarios, the total daily trips is generally similar to No Project levels, with the exception of transit trips to Fort Mason, which would increase 4.7% from the No Project level under the E-line extension scenario and increase 14.4% from the No Project level under the F-line extension scenario.

	Year 2005		Year 2030											
	Base		No Project				Option 1 - E-Line extension				Option 2 - F-Line extension			
	Number of Trips		Number of Trips		Percent Change from 2005		Number of Trips		Percent Change from No Project		Number of Trips		Percent Change from No Project	
Mode	Maritime Park	Fort Mason	Maritime Park	Fort Mason	Maritime Park	Fort Mason	Maritime Park	Fort Mason	Maritime Park	Fort Mason	Maritime Park	Fort Mason	Maritime Park	Fort Mason
Auto	10,255	5,668	10,799	6,125	5.3%	8.1%	10,681	6,080	-1.1%	-0.7%	10,642	6,084	-1.5%	-0.7%
Transit	1,618	780	1,868	845	15.5%	8.3%	1,842	885	-1.4%	4.7%	1,865	967	-0.2%	14.4%
Walk	2,956	1,407	3,140	1,481	6.2%	5.3%	3,124	1,471	-0.5%	-0.7%	3,138	1,486	-0.1%	0.3%
Bike	218	150	234	179	7.3%	19.3%	237	175	1.3%	-2.2%	243	179	3.8%	0.0%
Total	15,047	8,005	16,041	8,630	6.6%	7.8%	15,884	8,611	-1.0%	-0.2%	15,888	8,716	-1.0%	1.0%

Source: San Francisco County Transportation Authority, Travel Demand Model Run, August 2007.

Overall, the results from the SFCTA travel demand model show that the number of trips to the two districts increases slightly from 2005 to 2030. In the 2030 No Project scenario the number of trips increases the most, however this is due to increased auto trips. In both 2030 scenarios in which the streetcar is extended, the number of total trips is slightly below the No Project level, but the number of transit riders increases. In the two streetcar extension scenarios, the number of transit riders to the Maritime Park district declines slightly, while the number of transit riders to Fort Mason increases. This reflects a diversion of riders from existing transit lines within the Maritime Park district (such as the Powell-Hyde cable car) to the stops on the Fort Mason streetcar extension within the Fort Mason district.

5.3.7 Employee and Visitor Surveys

An important element in consideration of ridership on the extension is the fact that with the project, the majority of transit riders would have more opportunities for direct service to Fort Mason and would have more transit options available for different types of tripmaking. The need for the service and for transit options to the area and to Fort Mason in particular was documented in two surveys performed concerning visitor and employee access to Fort Mason. The *Fort Mason Center Employee Survey (2007)*¹⁸ (see Appendix F) concluded that approximately 17% of Fort Mason Center employees currently arrive at work by Muni and that 48% of employees noted they would have taken Muni to work if the F-line already served Fort Mason directly. Similarly, the *Fort Mason Intercept Survey (2007)*¹⁹ (see Appendix G) noted that approximately 11-14% of current visitors report that they took transit to Fort Mason and 45% of visitors said that they would have taken Muni if the F-line already served Fort Mason. It is often difficult to predict future behavior from stated preference surveys, but if the individuals who responded to the surveys accurately predicted the future behavior of visitors, then the project could serve as many as 45% of total future visitors or approximately 675,000 visitors a year, or approximately 1849 visitors a day. (This is higher than the future ridership estimated by the SFCTA model.) Fort Mason Center currently attracts approximately 1.5 million visitors a year.²⁰

5.3.8 Employment and Population Projections

A comparison of total future employment and population projections established by the Association of Bay Area Governments (ABAG) for the Maritime Park and Fort Mason districts for Year 2005 and 2030 is summarized below in Table 28. The projections indicate that the total employment for Year 2005 and 2030 at Maritime Park would respectively increase from approximately 2,442 to 3,024 persons and at Fort Mason would decrease from approximately 1,830 to 1,639 and. In addition, the population at Maritime Park would respectively increase from approximately 703 to 1,067 persons and at Fort Mason would increase from approximately 1,124 to 1,546 persons. The SFCTA model was run for this project using the ABAG 2002 and 2030 data.

	ABAG 2005 (1)		ABAG 2030	
	Maritime Park	Fort Mason	Maritime Park	Fort Mason
Total Employment	2,442	1,830	3,024	1,639
Population	703	1,124	1,067	1,546

(1) Based on ABAG Projections 2002 for 2005.

¹⁸ Wilbur Smith Associates, Fort Mason Center Employee Survey for the E-line Streetcar Extension Study, September 2007, p. 6-8.

¹⁹ Wilbur Smith Associates, *Fort Mason Center Intercept Survey for the E-line Streetcar Extension Study*, August 2007, p. 14-16.

²⁰ Doug Wright, Fort Mason Foundation. Email correspondence with Linda Peters of URS Corporation, March 19, 2009.

SECTION 6.0 COMPARISON OF VEHICLE REQUIREMENTS

Option 1 and Option 2 differ in the frequency of service provided on the extension to Fort Mason, and thus the peak vehicle demand generated by the options is different. The current peak demand for streetcars is 24 vehicles, including spares. When the future basic E-line is started, the peak demand will rise to 32 vehicles. In Option 1, the total peak vehicle demand, including spares, will rise to 33 vehicles, and in Option 2 it would rise to 36 vehicles, as shown in Table 29.

	Current	Current F-line and Basic E-line	Option 1 E-line to Fort Mason	Option 2 F-line to Fort Mason
E-line Peak Demand	0	6	7	6
F-line Peak Demand	20	18	18	21
Subtotal	20	24	25	27
30% Spares	6	8	8	9
Total	26	32	33	36

In the future peak vehicle demand scenarios, current F-line shuttle cars are assumed to be replaced by E-line cars, thus F-line peak vehicle demand goes down when the E-line is initiated. All of the future scenarios require more streetcars than SFMTA has currently available in the regular service fleet, which consists of 17 PCC cars and 10 Milan cars, for a total of 27 cars. SFMTA is undertaking two projects to increase the size of the regular service fleet. First, 11 additional PCC cars were purchased from New Jersey Transit, and they are undergoing rehabilitation. In addition, 4 Muni double-ended PCC cars are also undergoing rehabilitation. Once these cars are fully operational in the fleet, the regular service fleet should consist of 42 cars, which should be sufficient to cover the peak demand of all of the scenarios above, plus spares, plus an additional buffer amount to accommodate major overhaul schedules or service increases.

SECTION 7.0 EXTENSION INFRASTRUCTURE

7.1 STATIONS/PLATFORMS

Conceptual station locations along the proposed extension's alignment and at its terminal at the Fort Mason Center are shown in Appendix C. For detailed information on station locations, refer to the *Draft Conceptual Engineering Report* (dated January 22, 2009). Proposed station locations at the Fort Mason terminal point vary, depending on the type of terminal configuration (i.e., loop or wye).

All platforms would be sized to accommodate one light-rail vehicle, which are approximately 75 feet long. As streetcars are approximately 50 to 75 feet long, the low-level portion of the platform would need to be about 75 feet in length with an additional 35 to 45 feet needed for the

mini-high ramps that would be used for boarding persons with disabilities. Disabled boarding would be accommodated at right-side wayside ramps with mini high-level platforms. Bridge plates on the cars would be used at these platforms to allow for ADA-accessible boarding.

7.2 TURNBACK TRACK AT LEAVENWORTH AND BEACH

The proposed alignment includes a turnback track at Leavenworth and Beach. This would allow for turnback operations during an emergency, or if the terminal at Jones Street is full. Streetcars would operate under traffic signal control at this junction.

7.3 CABLE CAR CROSSING

At the intersection of Beach Street and Hyde Street the proposed streetcar would cross the existing cable car tracks. The cable car alignment is generally within the Hyde Street right-of-way; however at the Hyde and Beach streets intersection, the tracks curve into an off-street terminal in the northwest quadrant of the intersection, where a turntable is used to turn the cable cars. The cable car alignment is double track through the intersection at Beach Street and continues southerly on Hyde Street. The northbound cable cars coast through the intersection of Hyde and Beach streets, due to the vertical grades, which allow non-powered northbound operation through the intersection to the terminal. A grip channel is located between the northbound rails as it curves through the intersection. The northbound propulsion cables follow a separate alignment, continuing north of Beach Street under Hyde Street to a point immediately east of the turntable. The southbound cable car operates upgrade immediately upon leaving the Hyde Street terminal, and requires propulsion through the intersection. Because of the curved arrangement of the trackage, the propulsion cable is configured through the intersection on a “pull curve.” The pull curve is a complex subgrade structure for the cable that provides a horizontal pulley approximately every 6 feet along the alignment in order to guide the propulsion cable through the curve. This structure would require a custom, fabricated crossing to accommodate the cable car appurtenances, maintain traction power, and isolate the cable car trackage and cable machinery from stray current. The cable car system has a track gauge of 42”.

The actual design of the cable car crossing structure will be accomplished during preliminary engineering and final design. Streetcars crossing the cable car trackage would operate under traffic signal control at the Beach & Hyde intersection. Due to the high volume of pedestrian traffic at this intersection, in order to ensure that movements at this intersection proceed smoothly, it is recommended that all turns be prohibited from both eastbound and westbound Beach Street into Hyde Street.

7.4 JUNCTIONS

On the proposed extension, there would be three junctions of streetcar trackage. All would be under traffic signal control:

- Jefferson and Jones Streets (would also require separate signal phase for streetcars turning into Jones Street terminal)
- Beach and Jones Streets

- Beach and Leavenworth Streets

SECTION 8.0 TERMINAL OPERATIONS AT FORT MASON

8.1 LOOP TERMINALS

The loop terminals proposed at Fort Mason would operate similarly to SFMTA's current loop terminals, such as the Ocean Beach terminal on the N-Judah light rail line. Operations at a loop terminal would be at a slow speed, assumed at no more than five miles per hour.

SFMTA's current operations for the F-line schedules layover for two streetcars at the existing terminal on Jones Street at the same time. On-site observations, however, show that there are often three to four streetcars at the terminal at the same time. Thus the loop terminals have been designed to hold a minimum of three cars at the boarding platform.

For the North Loop option, upon exiting the tunnel's western portal, the streetcar would make a full stop at the facing point switch, then diverge right to operate counter-clockwise around the loop. The boarding and alighting platform with mini-high ramp would be adjacent to Building A, with an optional additional alighting platform just past the switch in the southeast corner of the parking lot. Operation through the parking lot would be in semi-reserved trackways, except where crossing traffic streams. In the South Loop option, the streetcar would board and de-board passengers at the same platform, and operation would all be in reserved right-of-way.

Signal control would be needed for the return trip eastbound, when the streetcar enters the single track to enter the tunnel. Track circuits would also be installed on the loop so that a streetcar can call for a signal for the tunnel as soon as it leaves the platform to make its eastbound trip, and track circuits would be used to detect occupancy so that the number of streetcars allowed west of the east portal could be controlled. No other signal control is anticipated for the loop terminal configuration.

A stub track would be used for storage of non-operational vehicles. This storage track would operate in a similar manner to SFMTA's operations at the current terminal for the N-Judah line, in which dead cars can be stored on a storage track, and not interfere with regular operations. This is depicted in Figure 10.

Figure 10: Loop Terminal for SFMTA's N-Judah Light-Rail Line



Estimated times that the streetcars would spend at the terminal point for the loop options are shown on Table 30. If the E-line is extended to Fort Mason, the streetcar would spend about 12.6 minutes at a North Loop configuration and about 12.6 minutes at a South Loop configuration, including layover time. If the F-line is extended to Fort Mason, the streetcar would spend about 14.6 minutes at a North Loop configuration and about 14.6 minutes at a South Loop configuration, including layover time. The F-line is a longer line than the proposed E-line, thus requires longer layover times. Estimated running time and delay time through the different segments of the loop terminals are also illustrated in Table 31.

It is important for scheduling purposes to know if the terminal can handle the headways desired at the facility. For the loop terminals, the scheduled time for a single car on the busiest line at the terminal would be the F-line, with 6-minute headways. Assuming that each car spent 15 minutes at the terminal (rounding up from 14.6), then no more than 3 cars on average would be at the terminal at the same time ($15/6 = 2.5$ cars, which rounds up to 3 cars). Both loop terminal configurations could thus handle the scheduled service levels. The North Loop has more capacity to absorb overflow cars, estimated at 4-5 additional cars. The addition of the separate alighting platform would ensure that this capacity could be handled comfortably. The South Loop could handle one additional overflow car as currently designed, though passengers onboard may have to wait a few moments to be discharged. Expansion of the loop or provision of an alighting platform immediately upon exiting the tunnel could increase the ability of this terminal to handle additional cars.

**Table 30
Terminal Times for Loop Options**

	North Loop -- E-line to Fort Mason				North Loop -- F-line to Fort Mason			
	Distance (feet)	Distance (mile)	Traveling speed (mph)	Time (mins)	Distance (feet)	Distance (mile)	Traveling speed (mph)	Time (mins)
Travel time: Portal to switch	20	0.00	5	0.05	20	0.00	5	0.05
Switch delay (15 seconds)				0.25				0.25
Travel time: Switch to platform	730	0.14	5	1.66	730	0.14	5	1.66
Layover				10.00				12.00
Travel time: Platform to portal	295	0.06	5	0.67	295	0.06	5	0.67
Total time				12.62				14.62

	South Loop -- E-line to Fort Mason				South Loop -- F-line to Fort Mason			
	Distance (feet)	Distance (mile)	Traveling speed (mph)	Time (mins)	Distance (feet)	Distance (mile)	Traveling speed (mph)	Time (mins)
Travel time: Portal to switch	125	0.02	5	0.28	125	0.02	5	0.28
Switch delay (15 seconds)				0.25				0.25
Travel time: Switch to platform	290	0.05	5	0.66	290	0.05	5	0.66
Layover				10.00				12.00
Travel time: Platform to portal	620	0.12	5	1.41	620	0.12	5	1.41
Total time				12.60				14.60

8.2 WYE TERMINALS

SFMTA has operated regular service with wye terminals in the past, including those located at Church & 30th Streets on the J-line and at Plymouth Avenue & Broad Street on the M-line. If a wye configuration is used at the Fort Mason extension's terminal, signal control and point

detection capabilities would be needed to control streetcar movements so that streetcars entering and exiting the single-track tunnel section are not in conflict with cars operating on the wye.

The pattern of operations for the North Wye turnaround alternative would involve the streetcar exiting the tunnel's western portal; diverging right using the wye's north leg, unloading passengers at the north platforms; reversing the car and backing through a spring switch onto the west leg of the wye, loading passengers at the platform near Laguna Street; and then traveling eastbound on the wye's base toward the tunnel. For the South Wye alternative, the streetcar would pull straight forward onto the west leg of the wye, discharge passengers next to the gatehouse, make a reverse movement through a spring switch onto the south leg of the wye, load passengers at the south platforms, and then pull forward through the switch to enter the single track to the tunnel.

If the E-line is extended to Fort Mason (Option 1), a wye terminal configuration could accommodate regular E-line operations. This line's frequency of service would be lower than that of the F-line, and consequently, it is not anticipated that more than two vehicles would be scheduled for layover at the Fort Mason terminal at the same time.

It would be difficult for any of the wye terminal options as designed to accommodate the F-line (Option 2), given the higher frequencies of this line and the number of cars likely to be at the terminal at the same time. The Full Wye design could be modified with different switch positions and a second loading platform to accommodate F-line headways.

Estimated times that the streetcars would spend at the terminal for the wye options, including layover, are shown on Table 31. If the E-line is extended to Fort Mason, the streetcar would spend about 13.3 minutes at a North Wye-shaped terminal, about 13.5 minutes at a Full Wye terminal, and about 12.9 minutes at a South Wye terminal. If the F-line is extended to Fort Mason, the streetcar would spend about 15.3 minutes at a North Wye configuration, about 15.5 minutes at a Full North Wye configuration, and about 14.9 minutes at a South Wye configuration.

Historically, SFMTA scheduled wye terminal movements to take between 2 and 3 minutes, during regular PCC operation prior to the conversion of the streetcar lines to LRV operation. See Appendix H for an explanation of SFMTA PCC car wye terminal operations in the past.

**Table 31
Terminal Times for Wye Options**

	North Wye -- E-line to Fort Mason				North Wye -- F-line to Fort Mason			
	Distance (feet)	Distance (mile)	Traveling speed (mph)	Time (mins)	Distance (feet)	Distance (mile)	Traveling speed (mph)	Time (mins)
Travel time: Portal to switch	30	0.01	5	0.07	30	0.01	5	0.07
Switch delay (15 seconds)				0.25				0.25
Travel time: Switch to platform	175	0.03	5	0.40	175	0.03	5	0.40
Reverse ends on car				1.00				1.00
Switch delay (15 seconds)				0.25				0.25
Travel time: Back up move to platform	225	0.04	3	0.85	225	0.04	3	0.85
Layover + change ends				10.00				12.00
Travel time: Platform to portal	210	0.04	5	0.48	210	0.04	5	0.48
Total time				13.30				15.30

	Full Wye -- E-line to Fort Mason				Full Wye -- F-line to Fort Mason			
	Distance (feet)	Distance (mile)	Traveling speed (mph)	Time (mins)	Distance (feet)	Distance (mile)	Traveling speed (mph)	Time (mins)
Travel time: Portal to switch	26	0.00	5	0.06	26	0.00	5	0.06
Switch delay (15 seconds)				0.25				0.25
Travel time: Switch to platform	175	0.03	5	0.40	175	0.03	5	0.40
Reverse ends on car				1.00				1.00
Switch delay (15 seconds)				0.25				0.25
Travel time: Back up move	215	0.04	3	0.81	215	0.04	3	0.81

	Full Wye -- E-line to Fort Mason				Full Wye -- F-line to Fort Mason			
	Distance (feet)	Distance (mile)	Traveling speed (mph)	Time (mins)	Distance (feet)	Distance (mile)	Traveling speed (mph)	Time (mins)
to platform								
Layover + change ends				10.00				12.00
Travel time: Platform to portal	300	0.06	5	0.68	300	0.06	5	0.68
Total time				13.45				15.45

	South Wye -- E-line to Fort Mason				South Wye -- F-line to Fort Mason			
	Distance (feet)	Distance (mile)	Traveling speed (mph)	Time (mins)	Distance (feet)	Distance (mile)	Traveling speed (mph)	Time (mins)
Travel time: Portal to switch	10	0.00	5	0.02	10	0.00	5	0.02
Switch delay (15 seconds)				0.25				0.25
Travel time: Switch to platform	140	0.03	5	0.32	140	0.03	5	0.32
Reverse ends on car				1.00				1.00
Switch delay (15 seconds)				0.25				0.25
Travel time: Back up move to platform	175	0.03	3	0.66	175	0.03	3	0.66
Layover + change ends				10.00				12.00
Travel time: Platform to portal	180	0.03	5	0.41	180	0.03	5	0.41
Total time				12.91				14.91

8.3 TERMINAL CAPACITY

The vehicle capacity for the five terminal options is summarized in Table 32. The loop options are higher capacity than the wye options.

Table 32 Terminal Capacity for Loop and Wye Options					
	North Loop	North Wye	South Loop	South Wye	Full Wye
Maximum car capacity regular service	3	2	3	2	2
Storage Capacity	1	0	2	0	2
Overflow Capacity	4-5	0	1	0	0
Total	8-9	2	6	2	4

SECTION 9.0 OPERATING ISSUES COMMON TO BOTH OPTIONS

9.1 OVERLAPPING E- AND F-LINE JOINT OPERATIONS ON NORTH EMBARCADERO

SFMTA plans to begin operation of the E-line at a future date. Once the E-line begins operation, E-line and F-line operations will overlap on a portion of The Embarcadero, and the two lines will share the trackage on the north Embarcadero, starting at the intersection of The Embarcadero & Don Chee Way, and continuing to the proposed junction for the Fort Mason Extension at Jones Street. The E- and F-lines would share stops on the north Embarcadero as well as on Jefferson and Beach streets. If the E-line began operation prior to the construction of the Fort Mason extension, then the two lines would also need to share the terminal on Jones Street. The trackage on this stretch of Embarcadero lies primarily in an exclusive right-of-way within the roadway median. Other traffic infrastructure along this stretch includes signalized intersections and signalized mid-block pedestrian crossings.

With the two lines operating together, combined service during the peak period would be 6 minute headways on the F-line (10 cars per hour), and 15 minute headways on the E-line (4 cars per hour). This would total 14 cars per hour, or a combined headway of approximately 4¼ minutes. Muni historically has operated streetcars at closer headways than this during regular operations, such as when the five current Metro lines (J, K, L, M, N) operated with PCC cars on the surface of Market Street.

Similar to joint operations elsewhere, such as the joint operation of the Muni Metro K-line and M-line along West Portal Avenue, there do not appear to be significant issues relevant to the joint operation of the E-line and F-line on the north Embarcadero. If the E-line began operation prior to the construction of the extension, it is likely that an alternate terminal would need to be identified for one of the lines. The current terminal on Jones Street is fully occupied during most hours of the day with current F-line cars, and it would be difficult to add E-line cars at this

terminal without impacting traffic operations on Jefferson, Jones and Beach streets. One possible temporary solution would be to use the turnback track at Pier 39 for the E-line terminal.

9.2 JUNCTION WITH F-LINE AT JEFFERSON AND JONES

Currently, the F-line streetcar travels west on Jefferson and makes a left turn (south) on Jones Street to reach the terminal and for the return trip to Market Street. The proposed extension would continue either the E-line or the F-line's route one block further west, turning south on Leavenworth.

A junction would need to be placed somewhere in the block of Jefferson between Taylor and Jones to allow the E and F-line cars to separate onto the appropriate routes. Two options for how this junction could be configured are shown in the Draft Conceptual Engineering Report, issued January 22, 2009. With either configuration, train-to-wayside communication (TWC) is needed to communicate streetcar route selection to the switch control mechanism. In addition, a special traffic signal control phase is needed for whichever line turns left onto Jones Street, as both junction options place the westbound track on Jefferson on the north side of the street (as is the current track), requiring a left turn from the right lane.

SFMTA staff has expressed a preference for combining the E and F-line trackage for as much of the Taylor-to-Jones block as possible, and having the junction as close as possible to Jones Street. This requires a midblock traffic signal to hold auto traffic back in order to accommodate the geometry necessary for the two routes to transition to the appropriate alignments for the subsequent blocks. A second option would be to leave the current F-line trackage in place, and separate the routes at a midblock location, where the F-line trackage currently changes lanes and moves to the north curb. The track for the line terminating on Jones Street would remain in the location for the current track, and the line continuing on to Fort Mason would run on a parallel track one lane to the south of the current track lane. This results in a diamond crossing at the intersection, but gives the line terminating at Jones Street flexibility in terminal operations if the terminal is full. It also obviates the need for the midblock signal.

The intersection of Jefferson and Leavenworth is not currently signalized. For this project, it would need to be signalized to allow the streetcar to turn left from the right lane on a special phase.

9.3 JUNCTION WITH F-LINE AT BEACH AND JONES AND AT LEAVENWORTH AND BEACH

Both of these intersections are proposed to be signalized as part of the project. SFMTA staff advised that no special signal control is needed at the intersection of Beach and Jones and at the intersection of Leavenworth and Beach. The streetcars can operate under regular traffic signal control at both of these intersections.

9.4 CABLE CAR CROSSING AT BEACH AND HYDE

The proposed alignment would intersect the Powell/Hyde cable car at Beach and Hyde Streets. Potential conflicts between cable car and streetcar operations would be avoided by giving priority to the cable car, given the streetcar's greater operating flexibility and the cable car's pull

curve location at this intersection. (The pull curve requires the cable car to keep the grip on the cable for the full width of the intersection and into the block of Hyde Street south of Beach, and the cable car should not be stopped once initiation of this movement has begun.)

Signaling at this intersection for the streetcar can be traffic-signal controlled, with priority provided to the cable car by means of a mechanism similar to the priority mechanism in place at California and Powell, which uses a magnetic switch to trigger cable car priority. All auto turns from eastbound and westbound Beach Street should be prohibited at this intersection, in order to ensure that auto traffic clears the intersection quickly and does not block following streetcars. Autos attempting to turn at this intersection are likely to be blocked by pedestrians crossing Hyde Street, which would cause delays to streetcars.

9.5 VAN NESS AVENUE CROSSING

The proposed alignment crosses a portion of Van Ness Avenue, which is adjacent to the eastern portal of the Fort Mason Tunnel. Currently, this area is primarily used for on-street parking, and the Bay Trail bisects this area, meaning that there are significant number of bicyclists and pedestrians moving in this vicinity.

The trackage for the proposed extension in this area includes the transition from the double track section coming from Beach Street with the single track section for the tunnel. Currently, there are two design options for the location of the switch from double to single track. In the first option, the switch would be located on the eastern side of Van Ness Avenue outside of the street right-of-way, and only a single track would cross Van Ness Avenue. In the second option, the switch would be located as closely as possible to the tunnel portal, with double track crossing Van Ness Avenue. The difference between these two locations is about 150 feet, or about 29 seconds of running time at 3.5 mph. As stated in the SFMTA Position Paper on *Historic Streetcar Fort Mason/ Presidio Extension Operating Consideration: Minimum Length Single-track Alignment for Fort Mason Tunnel Segment Only* (2004),²¹ the single-track section through the Fort Mason tunnel should be limited to the shortest feasible length in an effort to minimize capacity constraints, reduce disruptions to service reliability, and improve the ability to serve riders as demand develops. Table 33 shows the calculations for the running times for the single track section of the tunnel and the approaches on either side.

With either design option, there would be boarding platforms located near the Speaker Tower. With the second option for the switch location, the platforms could be located closer to the tunnel portal. With the first option, westbound streetcars would wait at the westbound platform for signal clearance before proceeding onto the single track section. In the second option, SFMTA staff has expressed a preference to have the streetcars move as closely as possible to the end of double track near the tunnel portal while waiting for signal clearance. Streetcars sitting in this location may block portions of Van Ness Avenue sidewalks and auto travel lanes.

NPS staff prefers that the transition to single track take place east of the Van Ness right-of-way, as providing a double-track crossing of Van Ness instead of a single track increases impacts in

²¹ San Francisco Municipal Transportation Agency, *Position Paper on Historic Streetcar Fort Mason/ Presidio Extension Operating Consideration: Minimum Length Single-track Alignment for Fort Mason Tunnel Segment Only*, August 6, 2004, page 4.

this area on the pathways, sidewalks, the historic rail right-of-way, and the contour of the landscape. Additionally, NPS staff prefers that the transition to single track not intersect with the walkway that leads to the promenade.

9.6 SINGLE-TRACK OPERATIONS THROUGH TUNNEL

The Fort Mason Tunnel is only wide enough to accommodate a single track. This fact places key limitations on the proposed streetcar operations through the tunnel, including constraints on running times and headways. In general, this project has assumed that only one streetcar at a time would occupy the tunnel, and that operations would proceed with a westbound car first, followed by an eastbound car, followed by a westbound car, etc in rotation. It would be possible to have a mid-tunnel signal installed to allow two streetcars in the same direction to proceed, with appropriate spacing between cars.

Running Times: The running time for the single track section is estimated at approximately 2.1 minutes (2 minutes, 4 seconds) for Transition Option B1 and 1.6 minutes (1 minute, 35 seconds) for Transition Option B2, assuming a travel speed of 15 miles per hour inside the tunnel and 3.5 miles per hour for surface approaches. (The ultimate duration would be determined by the terminal alignment that gets selected.) A summary of the running times by segment is provided in Table 33.

Table 33 Running Times by Segment						
Through tunnel						
	Distance (feet)	Distance (mile)	MPH (average)	Time (hour)	Time (min)	Time (sec)
OPTION B1						
Tunnel length	1500	0.28	15	0.0189	1.136	68.182
Western approach	108	0.02	3.5	0.0058	0.351	21.039
Eastern approach	180	0.03	3.5	0.0097	0.584	35.065
Total					2.071	124.286
OPTION B2						
Tunnel length	1500	0.28	15	0.0189	1.136	68.182
Western approach	108	0.02	3.5	0.0058	0.351	21.039
Eastern approach	30	0.01	3.5	0.0016	0.097	5.844
Total					1.584	95.065

Headways: With one-way running time estimates of between 1.5 minutes and just over 2 minutes, a prudent minimum headway to assume for opposing streetcars would be between 4 and 4.5 minutes for the single track section. This would allow cars time to clear switches and signals to clear. Table 34 illustrates a sample one-hour schedule for the single track section, assuming a one-way running time of 2.1 minutes, and a headway of 4.5 minutes. Table 35 illustrates a sample one-hour schedule for the single track section, assuming a one-way running time of 1.6 minutes, and a headway of 4 minutes. With these assumptions, Option B1 would

accommodate 11 streetcars per hour in each direction with a headway of 4.5 minutes and Option B2 would accommodate 14 streetcars per hour with a headway of 4 minutes. This is the maximum number of streetcars that could be operated through the single track section, though it would be difficult for any of the terminal designs under consideration to accommodate this many cars at the terminal in one hour, unless layover time at this terminal were severely reduced.

Table 34				
Option B1 (with 4.5-minute headway)				
Car	Eastbound		Westbound	
1	12:00:00	12:02:04	12:02:34	12:04:38
2	12:05:08	12:07:12	12:07:42	12:09:46
3	12:10:16	12:12:20	12:12:50	12:14:54
4	12:15:24	12:17:28	12:17:58	12:20:02
5	12:20:32	12:22:36	12:23:06	12:25:10
6	12:25:40	12:27:44	12:28:14	12:30:18
7	12:30:48	12:32:52	12:33:22	12:35:26
8	12:35:56	12:38:00	12:38:30	12:40:34
9	12:41:04	12:43:08	12:43:38	12:45:42
10	12:46:12	12:48:16	12:48:46	12:50:50
11	12:51:20	12:53:24	12:53:54	12:55:58
12	12:56:28	12:58:32	12:59:02	13:01:06
13	13:01:36	13:03:40	13:04:10	13:06:14
14	13:06:44	13:08:48	13:09:18	13:11:22
Note: Assumes 180 seconds to clear tunnel (western approach, tunnel length, eastern approach) and 30 seconds at either end of the tunnel.				

Table 35 Option B2 (with 4-minute headway)				
Car	Eastbound		Westbound	
1	12:00:00	12:01:35	12:02:05	12:03:40
2	12:04:10	12:05:45	12:06:15	12:07:50
3	12:08:20	12:09:55	12:10:25	12:12:00
4	12:12:30	12:14:05	12:14:35	12:16:10
5	12:16:40	12:18:15	12:18:45	12:20:20
6	12:20:50	12:22:25	12:22:55	12:24:30
7	12:25:00	12:26:35	12:27:05	12:28:40
8	12:29:10	12:30:45	12:31:15	12:32:50
9	12:33:20	12:34:55	12:35:25	12:37:00
10	12:37:30	12:39:05	12:39:35	12:41:10
11	12:41:40	12:43:15	12:43:45	12:45:20
12	12:45:50	12:47:25	12:47:55	12:49:30
13	12:50:00	12:51:35	12:52:05	12:53:40
14	12:54:10	12:55:45	12:56:15	12:57:50
15	12:58:20	12:59:55	13:00:25	13:02:00
16	13:02:30	13:04:05	13:04:35	13:06:10

Note: Assumes 90 seconds to clear tunnel (western approach, tunnel length, eastern approach) and 30 seconds at either end of the tunnel.

Switch position at the east end of the tunnel: As noted in Section 9.5, the position of the switch in the transition portion of the alignment from double track to single track has a direct effect on the amount of single track in the alignment, and thus on the headways. Two switch position locations were explored, and the effect on running time is shown in Table 33. Assuming an average speed of 3.5 mph, in Option B-1, the switch is 180 feet east of the portal, which would be east of Van Ness Avenue, and the running time from switch to portal would be approximately 35 seconds. In Option B-2, the switch would be approximately 30 feet east of the tunnel’s eastern portal and the running time from switch to portal would be approximately 6 seconds. The difference in one-way running time between these two locations would be approximately 29 seconds at the assumed 3.5 mph average speed.

9.7 SPECIAL EVENTS

The Fort Mason Center is a major venue for special events and often draws sizeable crowds for the events. On these occasions, there may be higher demand for the streetcar service than normal and therefore more cars in operation. Special consideration needs to be made in these situations given the single track tunnel restricting potential throughput at this point in the alignment.

SFMTA staff have discussed whether or not signal protection for normal operations might preclude staging efforts to stack cars for special events at Fort Mason. A potential solution to this limitation would be to provide on-site supervision with manual supervision of cars during special events to allow fleeting of cars in the tunnel or stacking of “banked” cars at the terminal. For the loop alternatives, this could permit up to six to eight streetcars at the Fort Mason terminal at any one time. For the simple wye options, there could be only two streetcars at the Fort Mason terminal at any one time, unless additional storage tracks are provided.

A theoretical maximum hourly capacity for Fort Mason special events is shown in Table 36 based on Option B-1 and B-2. These two scenarios assume the events would occur during off peak hours and is based on the SFMTA scheduling standard with a Peak Period Load Factor goal of 85%.²² This theoretical capacity assumes 11 cars per hour per direction under Option B-1 with a maximum hourly capacity of 660 passengers and 14 cars per hour per direction under Option B-2 with a maximum hourly capacity of 840 passengers. Given that the F-line is already operating over capacity during peak hours, special events held at Fort Mason that affect peak hour operations may cause additional crowding on the system.

Option	Cars/hour per direction	Car Capacity (Muni Scheduling Standards)	Hourly Capacity
B-1	11	60	660
B-2	14	60	840

SECTION 10.0 STREETCAR MAINTENANCE FACILITIES

Geneva Yard is SFMTA’s primary facility for the repair and storage of the historic streetcar fleet. It is located at the intersection of San Jose and Geneva Avenues. The facility stores and maintains up to 50 historic streetcars and houses a paint/body shop for both light-rail and historic streetcar vehicles. As SFMTA currently has less than 50 operating historic streetcars, some light-rail vehicles are also stored in the Geneva Yard. Green Division is located across the street from Geneva Yard, and is the primary maintenance and storage facility for SFMTA’s LRVs and for heavy repairs on historic streetcars. The Upper Yard is also located nearby, which is used for storage of historic streetcars and light-rail vehicles as well as employee parking. Both Geneva and Green Divisions are operating at full capacity.

In 2008, SFMTA began using the new Metro East LRV facility near Third Street to store LRVs. Currently, 24 LRVs are stored at Metro East every evening, but over time it is anticipated that additional LRVs will be moved from Green Division to Metro East. This will allow additional storage space for historic streetcars at Geneva Yard. The Metro East facility is currently planned as a storage and maintenance yard for LRVs only.

The Duboce Yard is a satellite facility for historic streetcar rehabilitation and maintenance, staffed primarily by Market Street Railway volunteers. This facility is located at Market Street and Duboce Avenue.

²² San Francisco Municipal Transportation Agency, Short-Range Transit Plan for 2008-2027, p. 54.

SECTION 11.0 OPERATING COST ESTIMATES

11.1 METHODOLOGY

Preliminary operating costs were estimated using revenue vehicle hours (RVH) and fully allocated costs. The calculation of these is documented in Section 5 and in Appendix B. These RVH calculations do not include deadhead hours or hours for testing and maintenance.

The estimated RVH was multiplied by the hourly operating costs to get estimated operating costs for the existing F-line service; proposed F-line service with extension to Fort Mason; proposed E-line service with extension to Fort Mason; and proposed E-line service to Fisherman's Wharf. Fully allocated hourly costs were obtained from the FTA's National Transit Database (NTD) for SFMTA's light-rail operations. The most current NTD figures available were for 2007; these were escalated to 2009 dollars using a 3.5% annual escalation factor. Table 37 presents the estimated annual operating costs using this methodology.

Table 37 Estimated Operating Costs			
	RVH	Fully allocated costs per hour (1)	Estimated operating costs
Option 1			
E-Line (with extension to Fort Mason)	46,387	\$231	\$10,715,397
F-Line (Existing)	87,314	\$231	\$20,169,534
Total	133,701		\$30,884,931
Option 2			
E-Line (to Fisherman's Wharf)	39,165	\$231	\$9,047,115
F-Line (with extension to Fort Mason)	98,956	\$231	\$22,858,836
Total	138,121		\$31,905,951

(1) Escalated from FY07 NTD rate to FY09 by an annual rate of 3.5%

11.2 ADDITIONAL OPERATING COSTS

Table 38 below shows the costs (in 2009 dollars) for operating either the E-line or the F-line extension to Fort Mason, above the costs for running both the E-line and the F-line to Fisherman's Wharf. The current F-line operation costs approximately \$20.2 million annually to operate, and the base E-line would add an additional \$9.0 million in operating costs, for a total of approximately \$29.2 million. The operating costs to extend either of the two lines from Fisherman's Wharf to Fort Mason would be approximately \$1.7 million annually for the E-line or \$2.7 million annually for the F-line. The total operating cost would be approximately \$30.9 million for the E and F-lines if the E-line were extended to Fort Mason, or \$31.9 million if the F-line were extended, or a difference of approximately \$1.0 million annually between the two options.

Table 38 Additional Estimated Operating Costs									
	Current F-line		Base E-line		E-Extension		F-Extension		Total
	RVH	Cost	RVH	Cost	RVH	Cost	RVH	Cost	
Option 1	87,314	\$20,169,534	39,165	\$9,047,115	7,222	\$1,668,282	--	--	\$30,884,931
Option 2	87,314	\$20,169,534	39,165	\$9,047,115	--	--	11,642	\$2,689,302	\$31,905,951

Note: Operating costs are calculated from fully allocated costs per hour that are escalated from FY07 NTD rate to FY09 by an annual rate of 3.5%

Appendix A
SFMTA Streetcar Fleet Roster

FIGURE 7.38

Historic Vehicle Fleet Inventory**STREETCAR ROSTER**

CAR NO	YEAR	MANUFACTURER	ORIGIN/DESCRIPTION	IN SERVICE	NOTES
REGULAR SERVICE VEHICLES=27					
Single Ended (24 cars)					
1050	1946	St. Louis Car	PCC, former SEPTA, Muni wings scheme	1994	
1051	1946	St. Louis Car	PCC, former SEPTA, Muni simplified	1994	
1052	1946	St. Louis Car	PCC, former SEPTA, LA Rwy scheme	1994	
1053	1946	St. Louis Car	PCC, former SEPTA, Brooklym scheme	1994	
1054	1946	St. Louis Car	PCC, former SEPTA, PTC silver/cream	1994	Wrecked/Out of Service
1055	1946	St. Louis Car	PCC, former SEPTA, green/cream	1994	
1056	1946	St. Louis Car	PCC, former SEPTA, Kansas City scheme	1994	
1057	1946	St. Louis Car	PCC, former SEPTA, Cincinnati scheme	1994	
1058	1946	St. Louis Car	PCC, former SEPTA, CTA scheme	1994	
1059	1946	St. Louis Car	PCC, former SEPTA, Boston Elevated scheme	1994	
1060	1946	St. Louis Car	PCC, former SEPTA, PTC silver/cream	1994	
1061	1946	St. Louis Car	PCC, former SEPTA, PE Rwy scheme	1994	
1062	1946	St. Louis Car	PCC, former SEPTA, Louisville scheme	1994	
1063	1946	St. Louis Car	PCC, former SEPTA, Baltimore scheme	1994	
1807	1928	Accaio	Milan – purchased 1998 (formerly 1507)	2005	
1811	1928	Accaio	Milan – purchased 1998 (formerly 1911)	2000	
1814	1928	Accaio	Milan – purchased 1998	2000	
1815	1928	Accaio	Milan – purchased 1998 (formerly 1515)	2000	
1818	1928	Accaio	Milan – purchased 1998	2000	
1856	1928	Accaio	Milan – purchased 1998 (formerly 1556)	2000	
1859	1928	Accaio	Milan – purchased 1998	2000	
1888	1928	Accaio	Milan – purchased 1998 (formerly 1588)	2000	
1893	1928	Accaio	Milan – purchased 1998 (formerly 1793)	2000	
1895	1928	Accaio	Milan – purchased 1998 (formerly 1795)	2000	
Double Ended (3 cars)					
1007	1946	St. Louis Car	PCC, double ended, Red Arrow scheme	1994	
1010	1946	St. Louis Car	PCC, double ended, Muni blue/yellow	1994	
1015	1946	St. Louis Car	PCC, double ended, Illinois Term scheme	1994	

FIGURE 7.38

Historic Vehicle Fleet Inventory (continued)**STREETCAR ROSTER**

CAR NO	YEAR	MANUFACTURER	ORIGIN/DESCRIPTION	IN SERVICE	NOTES
SPECIAL SERVICE VEHICLES=6					
Double Ended (6 cars)					
1	1912	W.L. Holman	Muni's first car (2-person operation)		CPUC/ADA needed
130	1914	Jewett Car Co.	Muni (2-person operation)		CPUC/ADA needed
228	1934	English Electric	Blackpool "Boat" – open car (2-person operation)		CPUC/ADA needed
496	1039	Melbourne	Melbourne semi-convertible (2-person operation)		CPUC/ADA needed
578S	1895	John Hammond	Market St. Rwy (2-person operation)		CPUC/ADA needed
952	1923	Perley A. Thomas	New Orleans (leased, 2-person operation)		CPUC/ADA needed
CARS BEING REHABILITATED=11					
New Jersey PCCs (11 cars)					
1070	1946	St. Louis Car	PCC, former NJT, Newark PSCT Scheme	2007	
1071	1946	St. Louis Car	PCC, former NJT, Twin City Rapid Transit	2007	
1072	1946	St. Louis Car	PCC, former NJT, Mexico City Cream Scheme	2007	
1073	1946	St. Louis Car	PCC, former NJT, El Paso Scheme	2007	
1074	1946	St. Louis Car	PCC, former NJT, Toronto TCC Red Rocket	2007	
1075	1946	St. Louis Car	PCC, former NJT, Cleveland Orange and Brown	2007	
1076	1946	St. Louis Car	PCC, former NJT, Washington DC Blue	2007	
1077	1947	St. Louis Car	PCC, former NJT, Birmingham Cream and Green	2007	
1078	1946	St. Louis Car	PCC, former NJT, San Diego "Balboa Park Zoo"	2007	
1079	1946	St. Louis Car	PCC, former NJT, Detroit Red and Cream	2007	
1080	1946	St. Louis Car	PCC, former NJT, Los Angeles Fruit Salad Scheme	2007	
NON-ACTIVE VEHICLES=44					
Single Ended (21 cars)					
106	1922	Colanna	Moscow/Orel, Russia (2-person operation) (stored Duboce)		
1023	1951	St. Louis Car	PCC (stored outside Marin)		
1025	1951	St. Louis Car	PCC (stored outside Marin)		
1031	1951	St. Louis Car	PCC (stored outside Marin)		
1038	1951	St. Louis Car	PCC (stored outside Marin)		
1040	1952	St. Louis Car	PCC Last PCC Built in US (stored outside Marin)		
1103			PCC (stored outside Marin)		
1105	1946	St. Louis Car	PCC (stored outside Marin)		
1109	1946	St. Louis Car	PCC (stored outside Marin)		
1115	1946	St. Louis Car	PCC (stored outside Marin)		
1125			PCC (stored outside Marin)		
1139	1946	St. Louis Car	PCC (stored outside Marin)		
1155	1946	St. Louis Car	PCC (stored outside Marin)		
1158			PCC (stored outside Marin)		

FIGURE 7.38

Historic Vehicle Fleet Inventory (continued)**STREETCAR ROSTER**

CAR NO	YEAR	MANUFACTURER	ORIGIN/DESCRIPTION	IN SERVICE	NOTES
1168	1946	St. Louis Car	PCC (stored outside Marin)		
1704	1946	St. Louis Car	PCC (formerly 1128) (stored at Geneva)		
1834	1928	Accaio	Milan – purchased 1984 (Training Car)		
1979	1928	Accaio	Milan (Parts Car)		Parts Car
2133	1946	St. Louis Car	PCC, SEPTA (stored outside Marin)		
2147	1946	St. Louis Car	PCC, SEPTA (stored outside Marin)		
3557	1951	LHB	Hamburg (stored outside Marin)		Awaiting restoration
Double Ended (12 cars)					
151	1927	Kawasaki	Hankei/Osaka (2-person operation) (stored Pier 80)		
189	1912	J.G. Brill Co.	Oporto, Portugal open car (2-person operation) (Pier 80)		
351	1926	St. Louis Car	Johnstown PA (2-person operation) (stored Duboce)		
578J	1927	Fuginagata	Kobe/Hiroshima (2-person operation) (stored Duboce Yard)		
586	1930	Melbourne	Melbourne semi-convertible (2-person operation) (stored Pier 80)		
798	1924	Market St. Rwy	Muni (2-person operation) (stored Pier 80)		
913	1923	Perley A. Thomas	New Orleans (2-person operation)		Awaiting restoration
1006	1948	St. Louis Car	PCC – Muni – double ended (stored outside Marin)		
1009	1948	St. Louis Car	PCC – Muni – double ended (stored outside Marin)		
1011	1948	St. Louis Car	PCC – Muni – double ended (stored outside Marin)		
1264	1973	Boeing Vertol	US SLRV		
1320	1973	Boeing Vertol	US SLRV		Workcar
New (8 cars)					
162			From Orange Empire		Needs ADA/PUC
1026			From S. Lake Tahoe (stored at Marin)		Needs ADA/PUC
1027			From S. Lake Tahoe (stored outside Marin)		Needs ADA/PUC
1028			From S. Lake Tahoe (stored outside Marin)		Needs ADA/PUC
1033			PCC from Orange Empire (stored at Marin)		Needs ADA/PUC
1039			PCC from Orange Empire (stored at Marin)		Needs ADA/PUC
4008			From Pittsburgh, PA (stored at Marin)	1990	Needs ADA/PUC
4009			From Pittsburgh, PA (stored at Marin)	1990	Needs ADA/PUC
Status Unknown (2 cars)					
1130			PCC (stored inside Pier 80)		

TOTAL HISTORIC VEHICLE FLEET=86

FIGURE 7.38

Historic Vehicle Fleet Inventory (continued)

STREETCAR ROSTER

CAR NO	YEAR	MANUFACTURER	ORIGIN/DESCRIPTION	IN SERVICE	NOTES
OTHER VEHICLES=12					
Work Cars (3 cars)					
304	1907	United Railroads of SF	Line Car		Work Car
1008	1948	St. Louis Car	PCC – Muni – double ended rehabbed		Work Car
C-1	1917	Municipal Railway	Flatbed Work Motor		Work Car
Cars on Loan (9 cars)					
109					Bay Area Electric Ry Museum
1014					Sydney Tramway Museum
1030					Fox River Trolley Museum
1129					Kansas City RR Museum
1146					Kansas City RR Museum
1150					Merced
1153					Bay Area Electric Ry Museum
1159					Oregon Electric Ry
1164					Transport Museum of St. Louis

Appendix B
Vehicle Hours and Operating Costs

Vehicle Hours and Operating Costs

Current F-line

Weekday

Time Period	Long/Short	Headway	Basic Cycle	Ext Cycle	Total Cycle	Trips	Min	Vehicle Hrs	NTD Rate FY09*	Weekday Total Cost
Early AM	short	15	120	0.0	120	11	1320	22		
AM Peak 615-0906	short	6	120	0.0	120	21	2520	42		
Midday 0906-1505	short	8	120	0.0	120	50	6000	100		
PM Peak 1512-1807	short	7	120	0.0	120	25	3000	50		
Evening 1816-on	short	15	120	0.0	120	26	3120	52		
Total						133	15,960	266	\$ 231.00	\$ 61,446
Multiplier (weekdays/year)								261		\$ 261
Annualized								69,426		\$ 16,037,406

* Escalated from FY07 NTD rate to FY09 by annual rate of 3.5%

Weekend

Time Period	Long/Short	Headway	Basic Cycle	Ext Cycle	Total Cycle	Trips	Min	Vehicle Hrs	NTD Rate FY09*	Weekend Total Cost
AM 600-1000	short	10	120	0.0	120	11	1320	22		
Midday 1000-1800	short	8	120	0.0	120	50	6000	100		
PM 1800-2430am	short	15	120	0.0	120	25	3000	50		
Total						86	10,320	172	\$ 231.00	\$ 39,732
Multiplier (weekends/year)								104		\$ 104
Annualized								17,888		\$ 4,132,128

* Escalated from FY07 NTD rate to FY09 by annual rate of 3.5%

TOTAL (ANNUAL)

87,314 \$ 20,169,534

F-Line Extended to Fort Mason, Travel on Beach 2-Way

Weekday

Time Period	Long/Short	Headway	Basic Cycle	Ext Cycle	Total Cycle	Trips	Min	Vehicle Hrs	NTD Rate FY09*	Weekday Total Cost
Early AM	long	15	120	16.0	136	11	1496	25		
AM Peak 615-0906	long	6	120	16.0	136	22	2992	50		
Midday 0906-1505	long	8	120	16.0	136	50	6800	113		
PM Peak 1512-1807	long	7	120	16.0	136	24	3264	54		
Evening 1816-on	long	15	120	16.0	136	26	3536	59		
Total						133	18,088	301	\$ 231.00	\$ 69,639
Multiplier (weekdays/year)								261		\$ 261
Annualized								78,683		\$ 18,175,727
Current F-line								69,426		\$ 16,037,406
Marginal cost (Difference over current F-line)								9,257		\$ 2,138,321

* Escalated from FY07 NTD rate to FY09 by annual rate of 3.5%

Weekend

Time Period	Long/Short	Headway	Basic Cycle	Ext Cycle	Total Cycle	Trips	Min	Vehicle Hrs	NTD Rate FY09*	Weekend Total Cost
AM 600-1000	long	10	120	16.0	136	11	1496	25		
Midday 1000-1800	long	8	120	16.0	136	50	6800	113		
PM 1800-2430am	long	15	120	16.0	136	25	3400	57		
Total						86	11,696	195	\$ 231.00	\$ 45,030
Multiplier (weekends/year)								104		\$ 104
Annualized								20,273		\$ 4,683,078
Current F-line								17,888		\$ 4,132,128
Marginal cost (Difference over current F-line)								2,385		\$ 550,950

* Escalated from FY07 NTD rate to FY09 by annual rate of 3.5%

TOTAL (ANNUAL)

98,956 \$ 22,858,805

Assumed Pre-Existing Basic E-line (Caltrain Terminal to Fisherman's Wharf)

Weekday and Weekends

Time Period	Long/Short	Headway	Basic Cycle	Ext Cycle	Total Cycle	Trips	Min	Vehicle Hrs	NTD rate FY09*	Total Cost
All day 0600-2430	all long	15	87	0.0	87	74	6438	107.3		
Total						74	6438	107.3	\$ 231.00	\$ 24,786
Multiplier								365		\$ 365
Annualized								39,165		\$ 9,047,000

* Escalated from FY07 NTD rate to FY09 by annual rate of 3.5%

TOTAL (ANNUAL)

\$ 39,165 \$ 9,047,000

E-line Extension to Fort Mason to Pre-Existing Basic with F-Line Extension to Fort Mason, Travel on Beach 2-Way

Weekday and Weekends

Time Period	Long/Short	Headway	Basic Cycle	Ext Cycle	Total Cycle	Trips	Min	Vehicle Hrs	NTD rate FY09*	Total Cost
All day 0600-2430	all long	15	87	16.0	103	74	7625	127.1		
Total						74	7625	127.1	\$ 231.00	\$ 29,357
Multiplier								365		\$ 365
Annualized								46,387		\$ 10,715,373
Basic E-line								39,165		\$ 9,047,000
Above Basic E-line								7,222		\$ 1,668,374

* Escalated from FY07 NTD rate to FY09 by annual rate of 3.5%

TOTAL (ANNUAL)

\$ 46,387 \$ 10,715,373

Appendix C
Fort Mason Alignment with Terminal Alternatives



ote Track details enerali ed.

**PROPOSED ALIGNMENT WITH
TERMINAL ALTERNATIVE A.1**



February 2009
28067144

Transit Operations Plan
Historic Streetcar Extension
San Francisco, California

FIGURE 1



Note: Track details generalized.

**PROPOSED ALIGNMENT WITH
TERMINAL ALTERNATIVE A.2**



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Transit Operations Plan
Historic Streetcar Extension
San Francisco, California

FIGURE 2



Note: Track details generalized.

**PROPOSED ALIGNMENT WITH
TERMINAL ALTERNATIVE A.3**



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Transit Operations Plan
Historic Streetcar Extension
San Francisco, California

FIGURE



Note: Track details generalized.

**PROPOSED ALIGNMENT WITH
TERMINAL ALTERNATIVE A.4**



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Transit Operations Plan
Historic Streetcar Extension
San Francisco, California

FIGURE 4



Note: Track details generalized.

**PROPOSED ALIGNMENT WITH
TERMINAL ALTERNATIVE A.5**

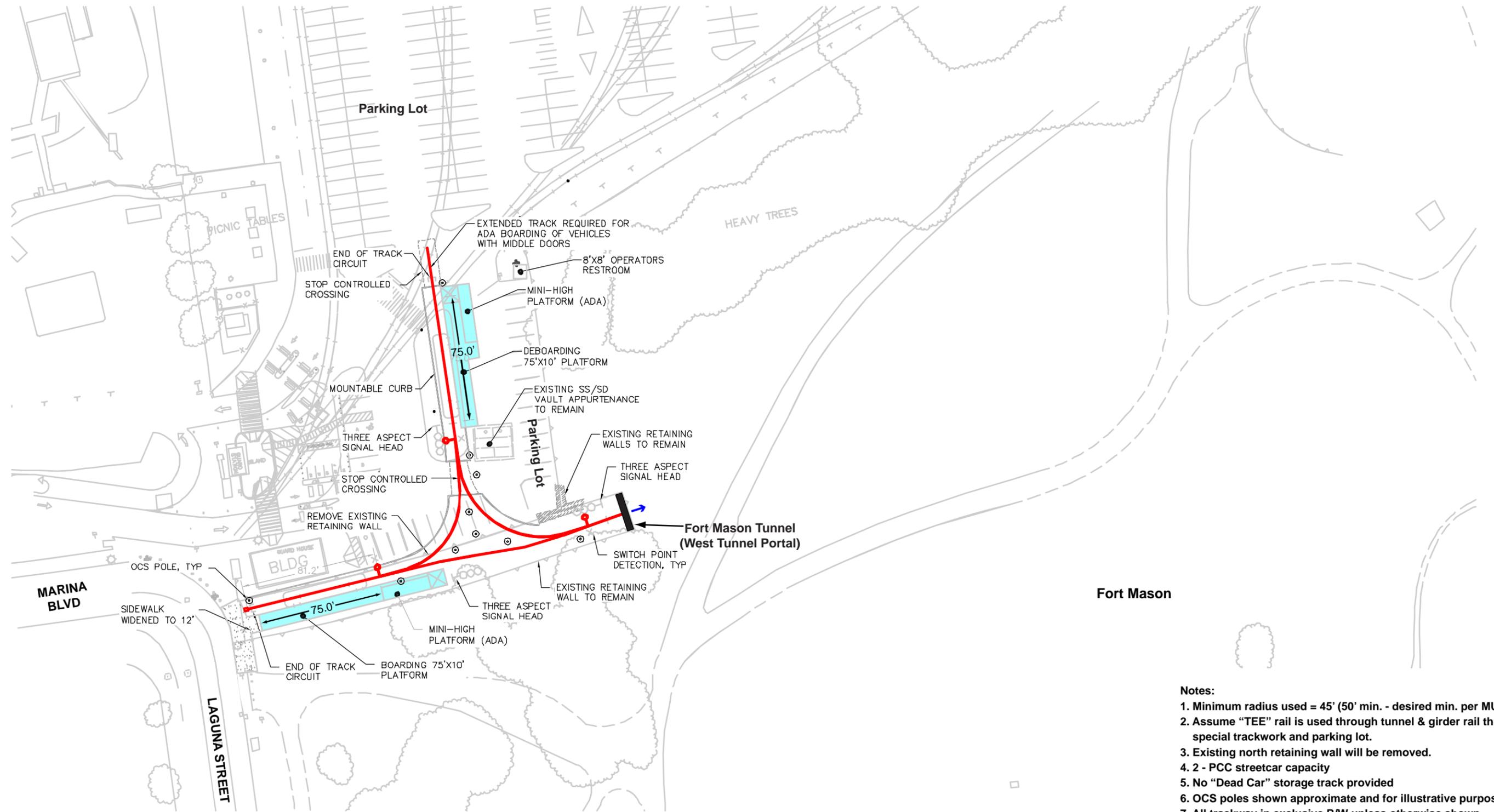


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Transit Operations Plan
Historic Streetcar Extension
San Francisco, California

FIGURE

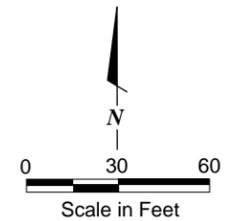
Appendix D
Fort Mason Turnaround Options



- Notes:**
1. Minimum radius used = 45' (50' min. - desired min. per MUNI)
 2. Assume "TEE" rail is used through tunnel & girder rail through special trackwork and parking lot.
 3. Existing north retaining wall will be removed.
 4. 2 - PCC streetcar capacity
 5. No "Dead Car" storage track provided
 6. OCS poles shown approximate and for illustrative purposes only.
 7. All trackway in exclusive R/W unless otherwise shown

LEGEND

	Proposed Streetcar Alignment
	Proposed Retaining Wall
	Turnout
	Sidewalk/Path
	Approximate OCS Pole Location
	Shared with Autos
	Station Platform



FORT MASON TURNAROUND
1 OF 5 - "WYE" NORTH (A.1)

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 Transit Operations Plan
 Historic Streetcar Extension
 San Francisco, California



FIGURE 1

San Francisco Bay

Parking Lot

HEAVY TREES

Fort Mason

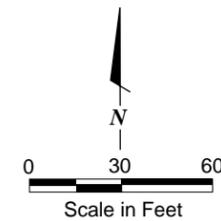
MARINA BLVD

LEGEND

-  Proposed Streetcar Alignment
-  Proposed Retaining Wall
-  Turnout
-  Approximate OCS Pole Location
-  Shared with Autos
-  Station Platform

Notes:

1. Minimum radius used = 50'
2. Assume "TEE" rail is used through tunnel & girder rail through special trackwork and parking lot.
3. Existing north retaining wall removed.
4. Streetcar encroaches on single track segment in order to enter storage track.
5. OCS poles shown approximate and for illustrative purposes only.
6. Reducing radius to 45ft may allow for additional parking. Parking configuration should be evaluated and optimized during preliminary engineering.
7. All trackway in exclusive R/W unless otherwise shown



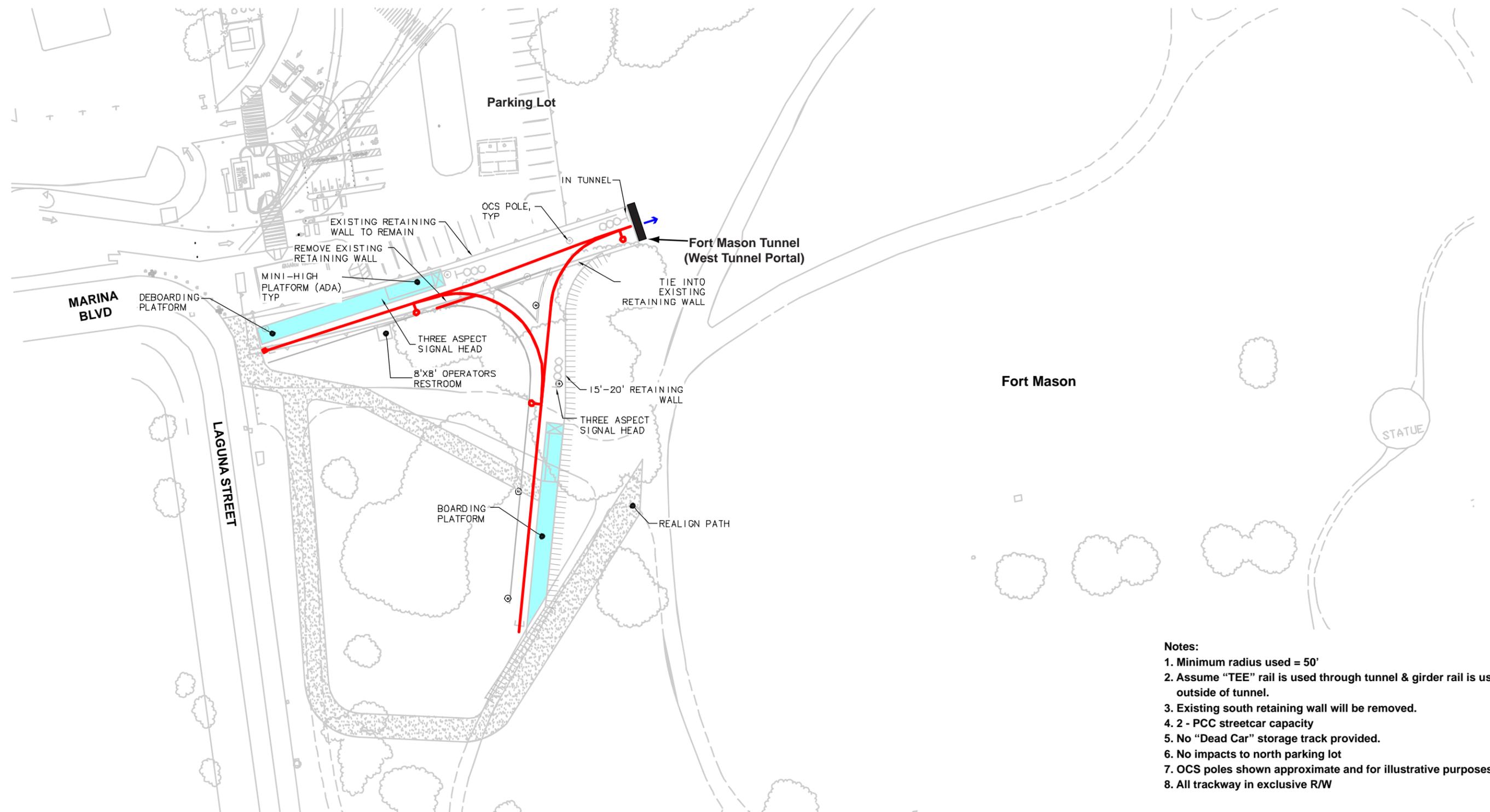
**FORT MASON TURNAROUND
2 OF 5 - LOOP NORTH (A.2)**



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San Francisco, California

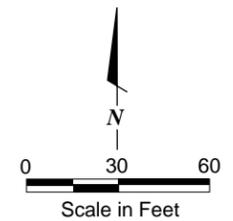
FIGURE 2



- Notes:**
1. Minimum radius used = 50'
 2. Assume "TEE" rail is used through tunnel & girder rail is used outside of tunnel.
 3. Existing south retaining wall will be removed.
 4. 2 - PCC streetcar capacity
 5. No "Dead Car" storage track provided.
 6. No impacts to north parking lot
 7. OCS poles shown approximate and for illustrative purposes only.
 8. All trackway in exclusive R/W

LEGEND

	Proposed Streetcar Alignment
	Proposed Retaining Wall
	Turnout
	Sidewalk/Path
	Approximate OCS Pole Location
	Shared with Autos
	Station Platform



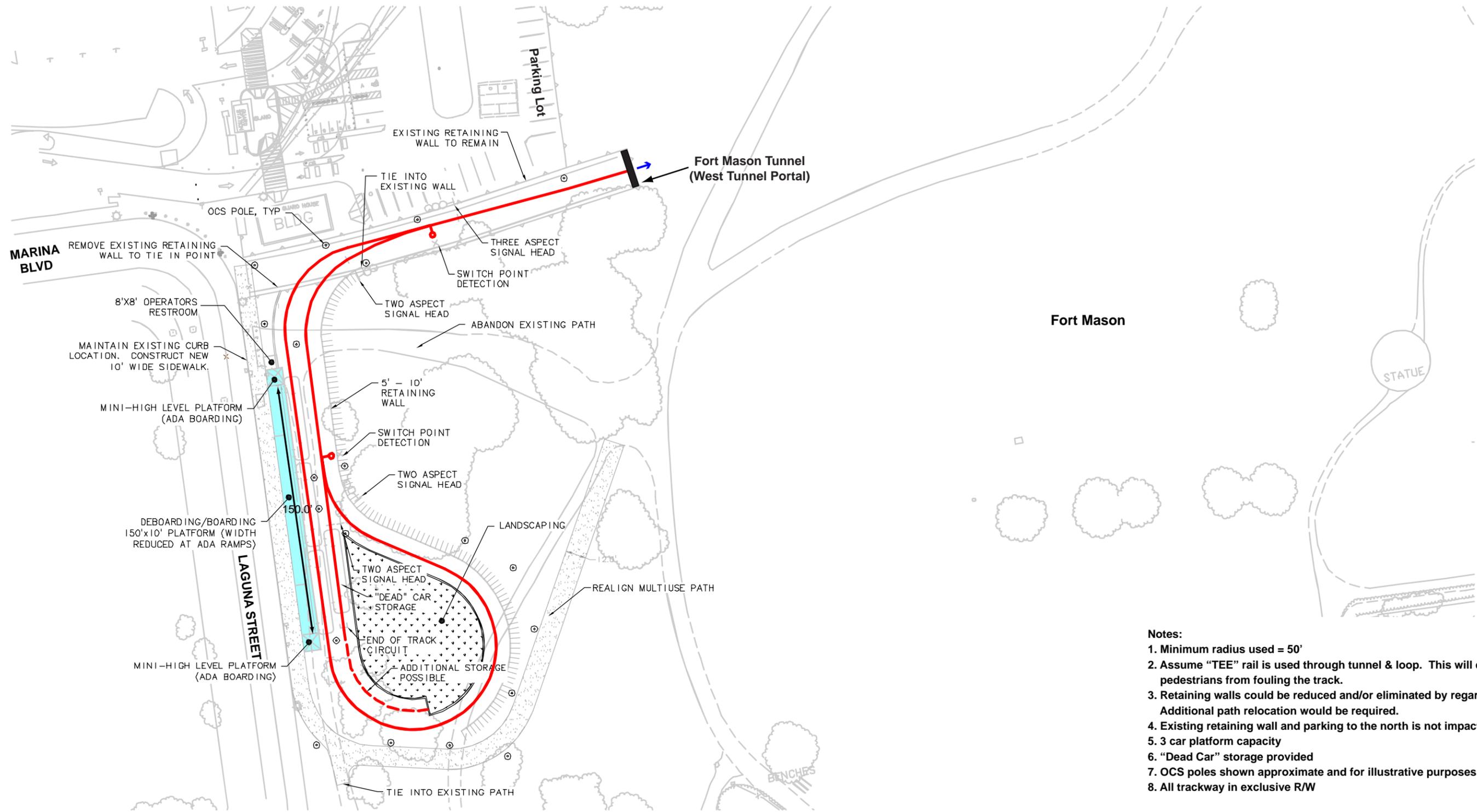
**FORT MASON TURAROUND
3 OF 5 - SOUTH "Y" (A.3)**



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Transit Operations Plan
Historic Streetcar Extension
San Francisco, California

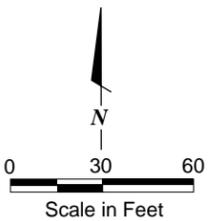
FIGURE 3



- Notes:**
1. Minimum radius used = 50'
 2. Assume "TEE" rail is used through tunnel & loop. This will deter pedestrians from fouling the track.
 3. Retaining walls could be reduced and/or eliminated by regarding. Additional path relocation would be required.
 4. Existing retaining wall and parking to the north is not impacted.
 5. 3 car platform capacity
 6. "Dead Car" storage provided
 7. OCS poles shown approximate and for illustrative purposes only.
 8. All trackway in exclusive R/W

LEGEND

	Proposed Streetcar Alignment
	Proposed Retaining Wall
	Turnout
	Sidewalk/Path
	Approximate OCS Pole Location
	Shared with Autos
	Station Platform



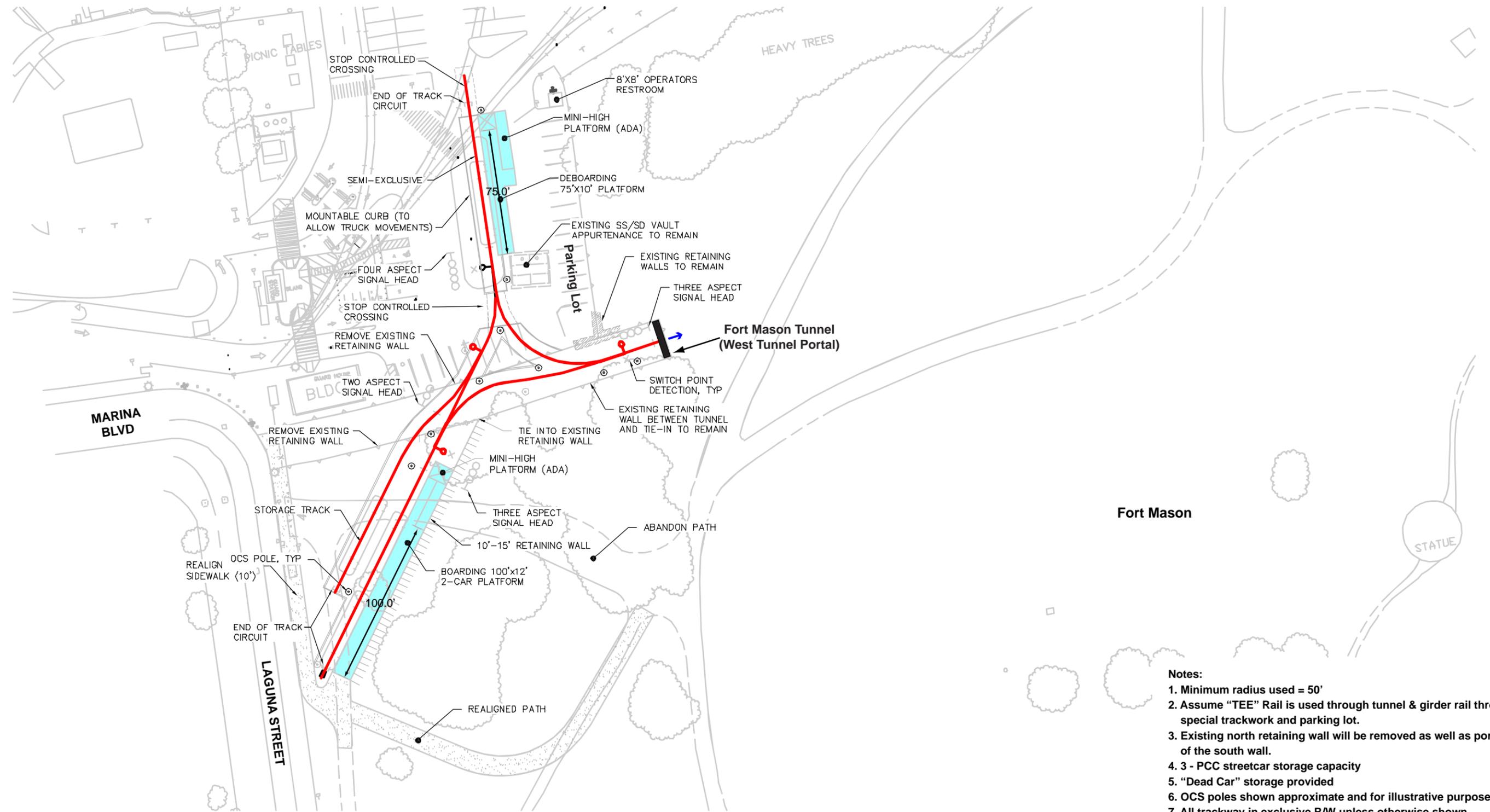
**FORT MASON TURNAROUND
4 OF 5 - SOUTH LOOP (A.4)**

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28067144

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Historic Streetcar Extension
San Francisco, California



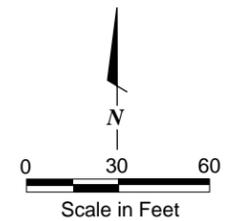
FIGURE 4



- Notes:**
1. Minimum radius used = 50'
 2. Assume "TEE" Rail is used through tunnel & girder rail through special trackwork and parking lot.
 3. Existing north retaining wall will be removed as well as portions of the south wall.
 4. 3 - PCC streetcar storage capacity
 5. "Dead Car" storage provided
 6. OCS poles shown approximate and for illustrative purposes only.
 7. All trackway in exclusive R/W unless otherwise shown.

LEGEND

	Proposed Streetcar Alignment
	Proposed Retaining Wall
	Turnout
	Sidewalk/Path
	Approximate OCS Pole Location
	Shared with Autos
	Station Platform



FORT MASON TURNAROUND
5 OF 5 - "FULL" WYE (A.5)
 Transit Operations Plan
 Historic Streetcar Extension
 San Francisco, California
 February 2009
 28067144



FIGURE 5

Appendix E
SFCTA Model Ridership and Load Factor Assumptions and Output



**ENVIRONMENTAL IMPACT STATEMENT FOR THE
EXTENSION OF HISTORIC STREETCAR SERVICE FROM FISHERMAN'S WHARF
TO THE SAN FRANCISCO MARITIME NATIONAL HISTORICAL PARK
AND GOLDEN GATE NATIONAL RECREATION AREA'S FORT MASON CENTER**

MODEL RUNS

1. TASK 1 – 2030 NO-BUILD

a. Alignment Description

- Include existing Muni service.
- Include E-line operating in The Embarcadero median between N-line terminal on King at Fourth and the current Fisherman's Wharf terminal on Jones & Jefferson.
- Include F-line on current alignment between Castro and Jones & Jefferson.
- Include Third Street LRT and the Central Subway.
- Include new Transbay Transit Center but do not include Caltrain Downtown Extension.

b. Station Locations

- Use current LRV stops on South Embarcadero and current F-line stops on North Embarcadero to Fisherman's Wharf

c. Headways

- E-line - 15 min peak, 15 min off-peak, 15 min evening
- F-line - 6 min AM peak, 8 min off-peak, 7 min PM peak, 15 min evenings

d. Service Hours

- E-line - 6:00 am to 1:00 am, seven days a week
- F-line - 6:00am to 1:00 am, seven days a week

e. Running Time

- See attached running time by segment spreadsheet

f. Car Capacity

- 70

2. TASK 2 – 2030 F-LINE EXTENSION

a. Alignment Description

- Include everything in 2030 No Build (Task 1)
- Include E-line operating in The Embarcadero median between N-line terminal on King at Fourth and the current Fisherman's Wharf terminal on Jones at Jefferson.
- Include F-line on existing alignment from 17th at Castro to Fisherman's Wharf extended from current stop on Jefferson at Taylor to Fort Mason as follows:

Inbound: Via Jefferson, L-Leavenworth, R-Beach to Polk, then via private ROW on NPS property to historic tunnel west of Van Ness, then via tunnel to Fort Mason. Assume turnaround at Fort Mason Center, as shown as Option 1 in Feasibility Study.

Outbound: From Fort Mason via same route to Beach Street, then via Beach to meet current track on Beach at Jones.

b. Station Locations for extension

Inbound

- Jefferson at Taylor (existing)
- Jefferson at Leavenworth
- Beach at Hyde
- Beach at Polk
- Fort Mason Turnaround (assume within Fort Mason Center parking lot as shown in Feasibility Study as Option 1).

Outbound

- Fort Mason Turnaround
- Beach at Polk
- Beach at Hyde
- Beach at Jones
- Beach at Mason (existing)

c. Headways

- E-line - 15 min peak, 15 min off-peak, 15 min evening
- F-line (all trips extended to Fort Mason) - 6 min AM peak, 8 min off-peak, 7 min PM peak, 15 min evenings

d. Service Hours

- E-line - 6:00 am to 1:00 am, seven days a week
- F-line - 6:00 am to 1:00 am seven days a week

e. Running Time

- See attached running time by segment spreadsheet

f. Car Capacity

- 70

3. TASK 3 – 2030 E-LINE EXTENSION

a. Alignment Description

- Include everything in 2030 No Build (Task 1)
- Include F-line on existing alignment between 17th at Castro and the current Fisherman’s Wharf terminal on Jones at Jefferson
- Include E-line from King at Fourth along The Embarcadero to Fisherman’s Wharf, then extended from stop on Jefferson at Taylor as follows:

Inbound: Via Jefferson, L-Leavenworth, R-Beach to Polk, then via private ROW on NPS property to historic tunnel west of Van Ness, then via tunnel to Fort Mason. Assume turnaround at Fort Mason Center, as shown as Option 1 in Feasibility Study.

Outbound: From Fort Mason via same route to Beach Street, then via Beach to meet current track on Beach at Jones.

b. Station Locations for extension

Inbound

- Jefferson at Taylor (existing)
- Jefferson at Leavenworth
- Beach at Hyde
- Beach at Polk
- Fort Mason Turnaround (assume within Fort Mason Center parking lot as shown in Feasibility Study as Option 1).

Outbound

- Fort Mason Turnaround
- Beach at Polk
- Beach at Hyde
- Beach at Jones
- Beach at Mason (existing)

c. Headways

- E-line - 15 min peak, 15 min off-peak, 15 min evening
- F-line - 6 min AM peak, 8 min off-peak, 7 min PM peak, 15 min evenings

d. Service Hours

- E-line - 6:00 am to 1:00 am seven days a week
- F-line - 6:00 am to 1:00 am seven days a week

e. Running Time

- See attached running time by segment spreadsheet

f. Car Capacity

- 70

Weekday Running Times

E-line	AM Peak (8am trip)	Midday (1pm trip)	PM Peak (5pm trip)	Evening (9pm trip)	Owl (3am trip)
E-line 2025 No Build					
Inbound					
King/4st - Frry/Bldg	12	15	16	12	0
Frry/Bldg - Embr/Stok	9	12	12	9	0
Embr/Stok - Jone/Bech	6	7	7	4	0
Total	27	34	35	25	0
Outbound					
Jone/Bech - Bech/Stok	4	7	6	6	0
Bech/Stok - Frry/Bldg	8	9	11	9	0
Frry/Bldg - King/4St	11	14	15	11	0
Total	23	30	32	26	0

E-line 2025 Extended to Fort Mason					
Inbound					
King/4st - Frry/Bldg	12	15	16	12	0
Frry/Bldg - Embr/Stok	9	12	12	9	0
Embr/Stok - Jone/Bech	6	7	7	4	0
Jone/Bech - Fort/Masn	8	8	8	8	0
Total	35	42	43	33	0
Outbound					
Fort/Masn - Jone/Bech	8	8	8	8	0
Jone/Bech - Bech/Stok	4	7	6	6	0
Bech/Stok - Frry/Bldg	8	9	11	9	0
Frry/Bldg - King/4St	11	14	15	11	0
Total	31	38	40	34	0

Source:

- 1) Segment run times for E-line No-Build route segments from Muni's "Preliminary E-Embarcadero Line Operating Plan" - dated June 30, 2000, and normalized to match F-line No-Build segment run times on common segments.
- 2) Extension segment run times (yellow) from LTK memo 4/22/04 on operations for 2004 Extension Feasibility Study, as modified by email from Muni (Ron Niewiarowski) dated 3/1/07. As modified, segment portion from Van Ness Ave to Fort Mason calculated at 17.5mph by LTK, and segment from Jones St to Van Ness Ave estimated at 5mph by Muni/SFCTA, based on NextBus data for current F-line operating speeds.

Weekday Running Times

F-line	AM Peak (8am trip)	Midday (1pm trip)	PM Peak (5pm trip)	Evening (9pm trip)	Owl (3am trip)
F-line 2025 No Build					
Inbound					
17/Castro - Mrkt/Chur	4	5	5	4	0
Mrkt/Chur - Mrkt/VN	8	8	8	7	0
Mrkt/VN - Mrkt/7th	4	5	5	4	0
Mrkt/7th - Mrkt/4th	4	4	4	3	0
Mrkt/4th - Mrkt/1st	3	4	3	3	0
Mrkt/1st - Steu/Loop	4	5	5	4	0
Steu/Loop - Embr/Stok	9	12	12	9	0
Embr/Stok-Jone/Bech	6	7	7	4	0
Total	42	50	49	38	0
Outbound					
Jone/Bech - Bech/Stok	4	7	6	6	0
Bech/Stok - Steu/Loop	8	9	11	9	0
Steu/Loop - Mrkt/Batt	4	5	5	4	0
Mrkt/Batt - Mrkt/Stok	4	5	5	4	0
Mrkt/Stok - Mrkt/7St	3	6	5	4	0
Mrkt/7St - Mrkt/VN	4	5	5	4	0
Mrkt/VN - Mrkt/Chur	4	5	6	5	0
Mrkt/Chur - 17/Noe	4	5	5	4	0
Total	35	47	48	40	0

F-line 2025 Extended to Fort Mason					
Inbound					
17/Castro - Mrkt/Chur	4	5	5	4	0
Mrkt/Chur - Mrkt/VN	8	8	8	7	0
Mrkt/VN - Mrkt/7th	4	5	5	4	0
Mrkt/7th - Mrkt/4th	4	4	4	3	0
Mrkt/4th - Mrkt/1st	3	4	3	3	0
Mrkt/1st - Steu/Loop	4	5	5	4	0
Steu/Loop - Embr/Stok	9	12	12	9	0
Embr/Stok-Jone/Bech	6	7	7	4	0
Jone/Bech - Fort/Masn	8	8	8	8	0
Total	50	58	57	46	0
Outbound					
Fort/Masn - Jone/Bech	8	8	8	8	0
Jone/Bech - Bech/Stok	4	7	6	6	0
Bech/Stok - Steu/Loop	8	9	11	9	0
Steu/Loop - Mrkt/Batt	4	5	5	4	0
Mrkt/Batt - Mrkt/Stok	4	5	5	4	0
Mrkt/Stok - Mrkt/7St	3	6	5	4	0
Mrkt/7St - Mrkt/VN	4	5	5	4	0
Mrkt/VN - Mrkt/Chur	4	5	6	5	0
Mrkt/Chur - 17/Noe	4	5	5	4	0
Total	43	55	56	48	0

Source:

- 1) Segment run times for F-line No-Build route segments from Muni's January 2006 rotations.
- 2) Extension segment run times (yellow) from LTK memo 4/22/04 on operations for 2004 Extension Feasibility Study, as modified by email from Muni (Ron Niewiarowski) dated 3/1/07. As modified, segment portion from Van Ness Ave to Fort Mason calculated at 17.5mph by LTK, and segment from Jones St to Van Ness Ave estimated at 5mph by Muni/SFCTA, based on NextBus data for current F-line operating speeds.

Ft Mason E-line Extension Boardings & Passenger Miles 2005 Forecast

Base

	AM	MD	PM	EV	OWL	DAILY	ANNUAL
MUNI SYSTEMWIDE							
Boardings	199,609	219,859	182,183	113,090	5,546	720,287	228,330,979
Passenger Miles	422,356	406,802	344,741	193,792	15,707	1,383,398	438,537,166
E-line							
Boardings						0	0
Passenger Miles						0	0
F-line							
Boardings	5,259	5,691	5,822	1,809	0	18,581	5,890,177
Passenger Miles	7,971	9,736	9,462	3,041	0	30,210	9,576,570
TOTAL (E+F)							
Boardings	5,259	5,691	5,822	1,809	0	18,581	5,890,177
Passenger Miles	7,971	9,736	9,462	3,041	0	30,210	9,576,570

Annualization Factor: 317

Ft Mason E-line Extension Boardings & Passenger Miles 2030 Forecast

Build	Muni Metro Trips:							Average
	AM	MD	180923 PM	181421 EV	180780 OWL	181237 DAILY	180863 ANNUAL	181044.8
	MUNI SYSTEMWIDE							
Boardings	254,379	259,498	229,227	133,804	11,709	888,617	281,691,589	
Passenger Miles	518,391	484,126	424,424	236,724	24,034	1,687,699	535,000,583	
E-line								
Boardings	1,954	2,166	1,972	2,069	0	8,161	2,587,037	
Passenger Miles	2,374	2,691	2,423	2,439	0	9,927	3,146,859	
F-line								
Boardings	4,713	5,352	5,192	1,766	0	17,023	5,396,291	
Passenger Miles	6,284	8,538	7,748	2,240	0	24,810	7,864,770	
TOTAL (E+F)								
Boardings	6,667	7,518	7,164	3,835	0	25,184	7,983,328	
Passenger Miles	8,658	11,229	10,171	4,679	0	34,737	11,011,629	

No Project	Muni Metro Trips:							Average
	AM	MD	180659 PM	181432 EV	181361 OWL	180664 DAILY	180336 ANNUAL	180890.4
	MUNI SYSTEMWIDE							
Boardings	253,662	259,301	228,372	133,880	11,682	886,897	281,146,349	
Passenger Miles	517,004	483,481	422,047	236,118	23,955	1,682,605	533,385,785	
E-line								
Boardings	1,834	1,881	1,842	1,394	0	6,951	2,203,467	
Passenger Miles	2,010	2,020	2,070	1,434	0	7,534	2,388,278	
F-line								
Boardings	4,759	5,396	5,216	1,867	0	17,238	5,464,446	
Passenger Miles	6,340	8,629	7,738	2,375	0	25,082	7,950,994	
TOTAL (E+F)								
Boardings	6,593	7,277	7,058	3,261	0	24,189	7,667,913	
Passenger Miles	8,350	10,649	9,808	3,809	0	32,616	10,339,272	

CHANGE	Muni Metro Trips:							Average	% CHG
	AM	MD	264 PM	-11 EV	-581 OWL	573 DAILY	527 ANNUAL	154	
	MUNI SYSTEMWIDE								
Boardings	717	197	855	-76	27	1,720	545,240	0.2%	
Passenger Miles	1,387	645	2,377	606	79	5,094	1,614,798	0.3%	
E-line									
Boardings	120	285	130	675	0	1,210	383,570	17.4%	
Passenger Miles	364	671	353	1,005	0	2,393	758,581	31.8%	
F-line									
Boardings	-46	-44	-24	-101	0	-215	-68,155	-1.2%	
Passenger Miles	-56	-91	10	-135	0	-272	-86,224	-1.1%	
TOTAL (E+F)									
Boardings	74	241	106	574	0	995	315,415	4.1%	
Passenger Miles	308	580	363	870	0	2,121	672,357	6.5%	

Annualization Factor: 317

Ft Mason F-line Extension Boardings & Passenger Miles 2005 Forecast

Base

	AM	MD	PM	EV	OWL	DAILY	ANNUAL
MUNI SYSTEMWIDE							
Boardings	199,609	219,859	182,183	113,090	5,546	720,287	228,330,979
Passenger Miles	422,356	406,802	344,741	193,792	15,707	1,383,398	438,537,166
E-line							
Boardings						0	0
Passenger Miles						0	0
F-line							
Boardings	5,259	5,691	5,822	1,809	0	18,581	5,890,177
Passenger Miles	7,971	9,736	9,462	3,041	0	30,210	9,576,570
TOTAL (E+F)							
Boardings	5,259	5,691	5,822	1,809	0	18,581	5,890,177
Passenger Miles	7,971	9,736	9,462	3,041	0	30,210	9,576,570

Annualization Factor: 317

Ft Mason F-line Extension Boardings & Passenger Miles 2030 Forecast

Build	Muni Metro Trips:						Average	
	AM	MD	PM	EV	OWL	DAILY	ANNUAL	
			181156	181196	181339	181251	181595	181307.4
MUNI SYSTEMWIDE								
Boardings	253,599	260,034	229,232	133,377	11,615	887,857	281,450,669	
Passenger Miles	517,342	485,451	424,615	236,099	23,894	1,687,401	534,906,117	
E-line								
Boardings	1,751	1,742	1,728	1,331	0	6,552	2,076,984	
Passenger Miles	1,909	1,892	1,957	1,361	0	7,119	2,256,723	
F-line								
Boardings	5,669	7,735	7,028	2,129	0	22,561	7,151,837	
Passenger Miles	8,758	14,772	12,451	2,988	0	38,969	12,353,173	
TOTAL (E+F)								
Boardings	7,420	9,477	8,756	3,460	0	29,113	9,228,821	
Passenger Miles	10,667	16,664	14,408	4,349	0	46,088	14,609,896	

No Project	Muni Metro Trips:						Average	
	AM	MD	PM	EV	OWL	DAILY	ANNUAL	
			180659	181432	181361	180664	180336	180890.4
MUNI SYSTEMWIDE								
Boardings	253,662	259,301	228,372	133,880	11,682	886,897	281,146,349	
Passenger Miles	517,004	483,481	422,047	236,118	23,955	1,682,605	533,385,785	
E-line								
Boardings	1,834	1,881	1,842	1,394	0	6,951	2,203,467	
Passenger Miles	2,010	2,020	2,070	1,434	0	7,534	2,388,278	
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Boardings	4,759	5,396	5,216	1,867	0	17,238	5,464,446	
Passenger Miles	6,340	8,629	7,738	2,375	0	25,082	7,950,994	
TOTAL (E+F)								
Boardings	6,593	7,277	7,058	3,261	0	24,189	7,667,913	
Passenger Miles	8,350	10,649	9,808	3,809	0	32,616	10,339,272	

CHANGE	Muni Metro Trips:						Average	% CHG
	AM	MD	PM	EV	OWL	DAILY	ANNUAL	
			497	-236	-22	587	1,259	417
MUNI SYSTEMWIDE								
Boardings	-63	733	860	-503	-67	960	304,320	0.1%
Passenger Miles	338	1,970	2,568	-19	-61	4,796	1,520,332	0.3%
E-line								
Boardings	-83	-139	-114	-63	0	-399	-126,483	-5.7%
Passenger Miles	-101	-128	-113	-73	0	-415	-131,555	-5.5%
F-line								
Boardings	910	2,339	1,812	262	0	5,323	1,687,391	30.9%
Passenger Miles	2,418	6,143	4,713	613	0	13,887	4,402,179	55.4%
TOTAL (E+F)								
Boardings	827	2,200	1,698	199	0	4,924	1,560,908	20.4%
Passenger Miles	2,317	6,015	4,600	540	0	13,472	4,270,624	41.3%

Annualization Factor: 317

Appendix F
Fort Mason Employee Survey

FORT MASON CENTER EMPLOYEE SURVEY

for the

E-Line Streetcar Extension Study

Prepared by:



September 5, 2007

INTRODUCTION

The extension of Muni's E-Line streetcar service from Fisherman's Wharf to Fort Mason is seen as an important opportunity to increase access to Fort Mason and to better connect it to other major waterfront attractions. Potential usage of the extended streetcar service is a key factor for local transportation decisions as well as for attracting federal funds to extend the E-Line service.

Conventional travel demand models provide good estimates for typical types of trips, such as work trips, school trips and shopping trips. However, they tend to be weak at forecasting tourist trips to places like the Fort Mason Center. Visitor travel to Fort Mason Center is a significant source of patronage potential for the Historic Streetcar Extension Project. A better understanding of visitor travel to Fort Mason complements the conventional model-based forecasts for this project and will be prepared by the SFCTA using its regional travel model. The survey will also better define employee and tenant travel to/from Fort Mason and thereby better describe potential benefits of the E-Line extension to these groups. Parking is a major challenge at Fort Mason and improved public transit services appear to provide a means to help address this challenge.

Factors that are important to assessing potential transit usage include: group size (cost of fares); familiarity with transit service and regularity of trips to Fort Mason (San Francisco, Bay Area or other locations); mode of arrival to San Francisco and to Fort Mason; parking, time of arrival and departure, trip purpose and Muni prepaid fare. An employee survey and a visitor intercept survey were developed to help answer these questions. The following methodology and results are associated with the employee survey.

METHODOLOGY

Fort Mason's employees were the target population for this survey. The survey was distributed to all employees through their employer. Employees were asked to return the completed surveys to staff in the main office at the Fort Mason Foundation. The surveys were completed during the first weeks of June, 2007.

Instrument

A one-page, double-sided standardized survey form was developed for the intercept survey and is attached in Appendix A. The employees filled out the surveys on their own.

FINDINGS

Response Rate

One hundred and ten surveys were distributed to Fort Mason Center employees. Fifty-eight of these were completed, giving an overall response rate of 53%.

Survey Results

Respondents to the employee survey lived primarily in San Francisco but some commute from locations in the East Bay and Marin County. Figure 1 shows the home locations of these employees based on their home zip code.

The results to the employee survey mimicked the results of the visitor survey in terms of the support for the F-line extension to Fort Mason. Only one of the 58 responses was against the extension and one person did not respond to this question. According to the survey results, about half of the people who were in favor of its extension indicated they would have used it for their trip to Fort Mason. Question-by-question results to the survey can be for in Appendix B.

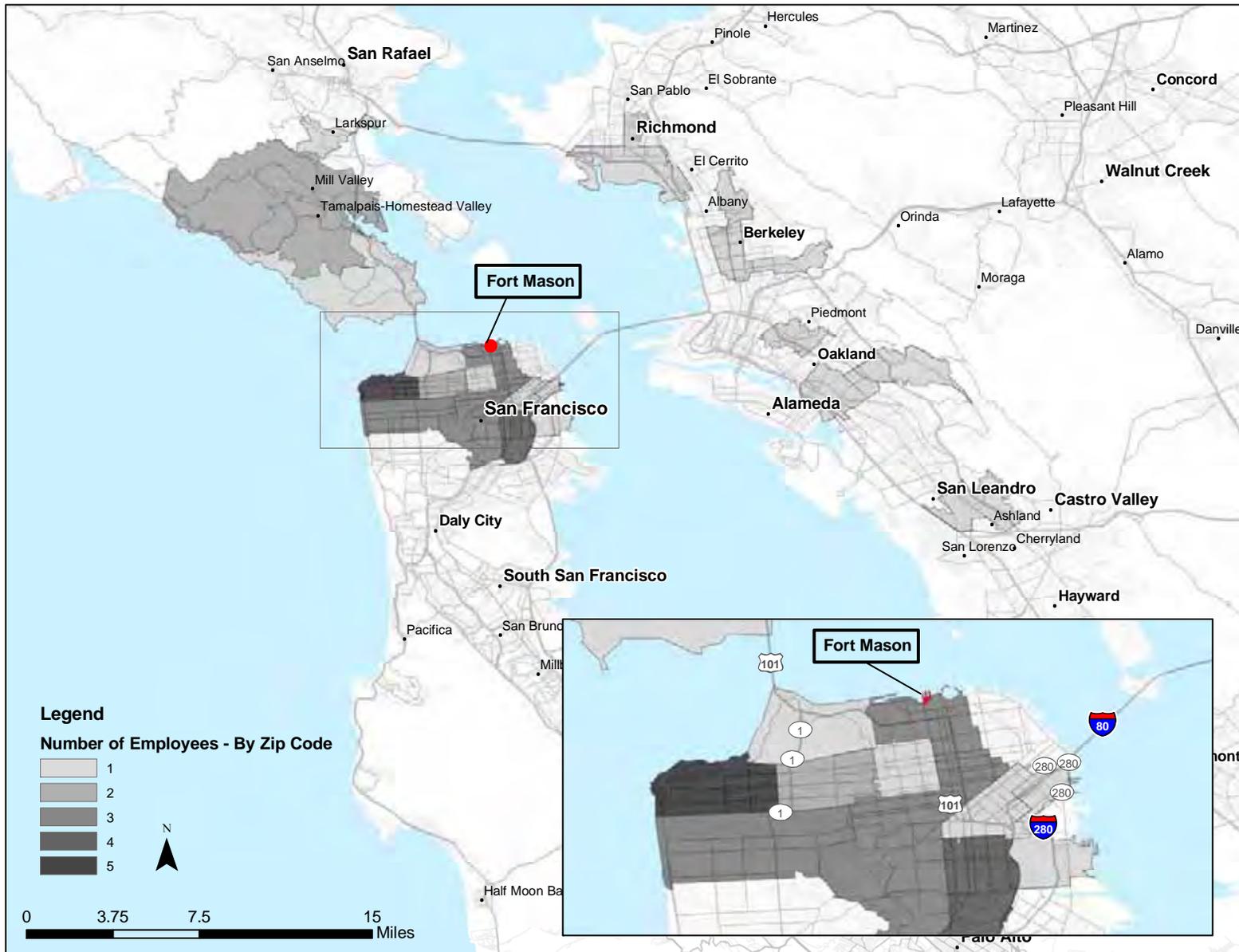


Figure 1
 EMPLOYEE HOME LOCATIONS BY ZIP CODE

Other significant findings from the survey included:

- 81% of employees are employed full-time but only 64% work a typical eight-hour, Monday thru Friday schedule.
- 2/3 of employees drive to work and nearly 80% of those who drive park inside the Fort Mason Center. The others who drive park outside the Fort Mason Center gate in the free parking lot by the Marina.
- 17% of employees take Muni to work and 14% of employees have a Muni Fast Pass.
- Nearly a third of all employees did not start their trip in San Francisco. The locations of these origins are shown in Figure 1 above.
- The majority of employees arrived at the Fort Mason Center between 8 and 11 AM and left between 4 and 7 PM.

APPENDIX A – SURVEY INSTRUMENT

ur e Form Pa e o



FORT MASON TRANSPORTATION SURVEY

The National Park Service (NPS) is evaluating an extension of Muni's historic streetcar service [F-line] to Fort Mason. The streetcar service now ends at Fisherman's Wharf. This short survey will help the NPS learn about your interest in choosing an historic streetcar for your travel to the Fort Mason area. It will take about 2 minutes and is voluntary and anonymous. Please complete the survey and submit it by or before **June 15, 2007**.

1. Which best describes you?

- Full time employed at Fort Mason Other (please specify) _____
 Part time employed at Fort Mason

2. What are your current work hours?

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
to _____	to _____	to _____	to _____	to _____	to _____	to _____

3. What is the zip code of your home address? _____

4. How did you arrive at Fort Mason today?

- Muni (please specify line) _____ Taxi
 Other bus service (please specify) _____ Walk
 BART Bike
 Drove alone and parked car Other (please specify) _____
 Shared a ride to Fort Mason (passenger)
 Got a ride from someone else and dropped off

5. If you drove your car, where did you park? If you did not drive, please skip this question.

- Inside Fort Mason Center (Fort Mason Center parking lot)
 Upper Fort Mason
 West of Fort Mason (Marina etc.)
 South of Fort Mason
 East of Fort Mason (Maritime Museum area, etc)

6. If you did not begin your trip in San Francisco, how did you get to San Francisco today?

- Transit (please specify the transit agency you used, e.g., BART, AC Transit, etc.) _____
 Ferry
 Car
 Other (please specify) _____

7. About what time did you arrive at the Fort Mason Center today? _____ am/pm

8. What time do you anticipate leaving the Fort Mason Center today? _____ am/pm

9. Do you use a Muni Fast Pass? Yes No

The last two questions refer to the proposed extension of the historic F-line streetcar service that currently terminates at Beach and Jones Streets near Fisherman's Wharf.

10. If the historic streetcar line already served Fort Mason Center, would you have used it for this trip?

- Yes No

11. Should the historic streetcar line be extended to Fort Mason Center?

- Yes No

Thank you for participating in our survey! A copy of the results will be available at the following web site: www.HistoricStreetcarExtension.org. You can also visit this web site for more information about the project.

Please return your completed survey directly to Lisa at the front desk or to Al Goncalvez, Managing Director of Fort Mason Center, by dropping it off in the mail slot at the front door of the main office, no later than **June 15, 2007**. All responses will be maintained in confidence and used strictly for the purpose of evaluating the potential patronage of the historic streetcar extension.

FORT MASON TRANSPORTATION SURVEY
(Continued from previous page)

This survey is being administered under the Federal Paperwork Reduction Act.

PRIVACY ACT and PAPERWORK REDUCTION ACT statement: 16 U.S.C. 1a-7 authorizes collection of this information. This information will be used by NPS managers to better serve the visiting public. Response to this request is completely voluntary and confidential. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid NPS permit number.

APPENDIX B – SURVEY RESULTS

Question-By-Question Summary

Q1: What best describes you or your group?

	Total	Percentage
No response	0	0%
Full Time Employed at Fort Mason	47	81%
Part Time Employed at Fort Mason	11	19%
Other	0	0%
Total	58	100.0%

Q2: What are your current work hours (employee type)?

	Total	Percentage
No response	0	0%
Full Time	37	64%
Weekday (not full time)	8	14%
Weekend (not full time)	0	0%
Combination of weekday and weekend	13	22%
Total	58	100.0%

Q3: What is the zip code of your home address? (see map – Figure 1 above)

Q4: How did you arrive at Fort Mason today?

	Total	Percentage
No response	0	0%
Muni	10	17%
Other Bus Service	0	0%
BART	0	0%
Drove alone and parked car	39	67%
Shared a ride to Fort Mason (passenger)	1	2%
Got a ride from someone else and dropped off	0	0%
Taxi	2	3%
Walk	3	5%
Bike	1	2%
Other	2	3%
Total	58	100.0%

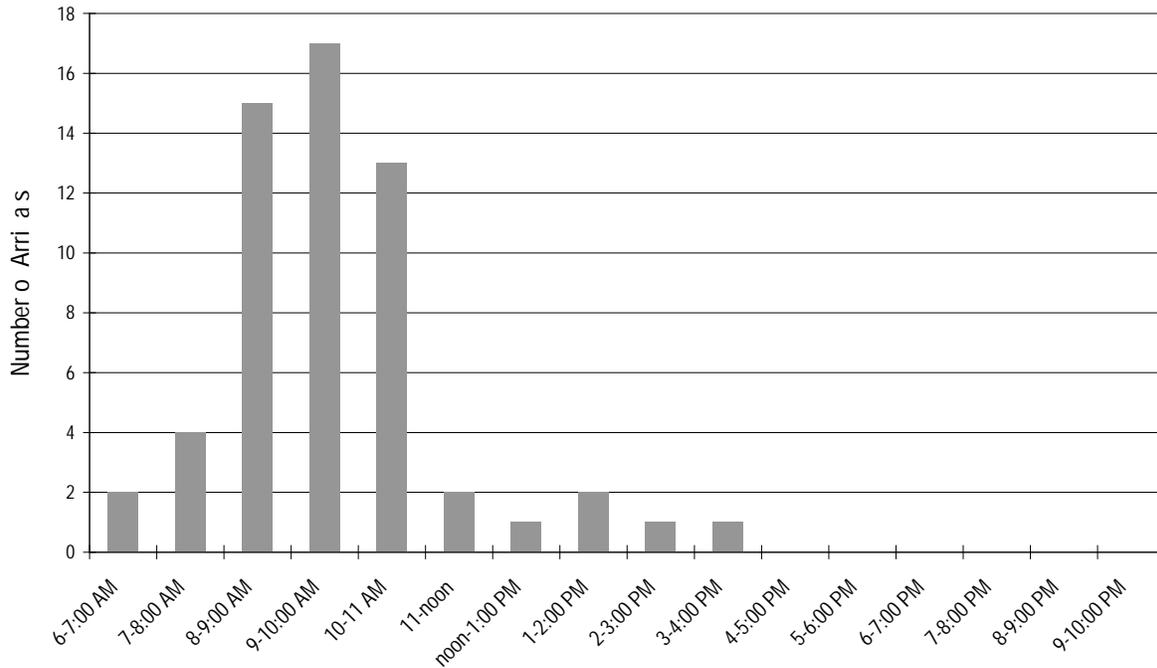
Q5: If you drove, where did you park?

	Total	Percentage
Inside Fort Mason Center	29	78%
Upper Fort Mason	0	0%
West of Fort Mason (Marina, etc.)	8	22%
South of Fort Mason	0	0%
East of Fort Mason	0	0%
Total	37	100.0%

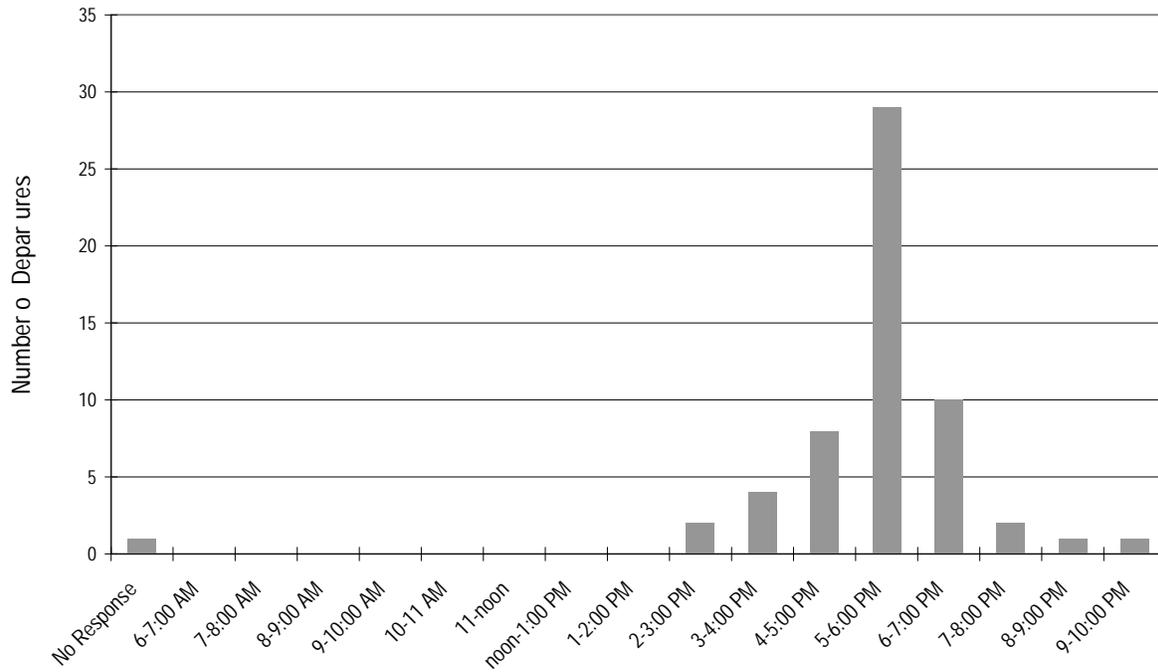
Q6: If you did not begin your trip in SF, how did you get to SF today?

	Total	Percentage
Transit	2	11%
Ferry	0	0%
Car	16	89%
Other	0	0%
Total	18	100.0%

Q7: About what time did you arrive at the Fort Mason Center today?



Q8: What time do you anticipate leaving the Fort Mason Center today?



Q9: Do you own a Muni Fast Pass?

	Total	Percentage
No response	2	3%
Yes	8	14%
No	48	83%
Total	58	100.0%

Q10: If the F-line already served Fort Mason would you have used it?

	Total	Percentage
No response	3	5%
Yes	28	48%
No	27	47%
Total	58	100.0%

Q11: Should the F-line be extended?

	Total	Percentage
No response	1	2%
Yes	56	96%
No	1	2%
Total	58	100.0%

Appendix G
Fort Mason Intercept Survey

FORT MASON CENTER INTERCEPT SURVEY

for the

E-Line Streetcar Extension Study

Prepared by:



August 10, 2007

INTRODUCTION

The extension of Muni's E-Line streetcar service from Fisherman's Wharf to Fort Mason is seen as an important opportunity to increase access to Fort Mason and to better connect it to other major waterfront attractions. Potential usage of the extended streetcar service is a key factor for local transportation decisions as well as for attracting federal funds to extend the E-Line service.

Conventional travel demand models provide good estimates for typical types of trips, such as work trips, school trips and shopping trips. However, they tend to be weak at forecasting tourist trips to places like the Fort Mason Center. Visitor travel to Fort Mason Center is a significant source of patronage potential for the Historic Streetcar Extension Project. A better understanding of visitor travel to Fort Mason complements the conventional model-based forecasts for this project and will be prepared by the SFCTA using its regional travel model. The survey will also better define employee and tenant travel to/from Fort Mason and thereby better describe potential benefits of the E-Line extension to these groups. Parking is a major challenge at Fort Mason and improved public transit services appear to provide a means to help address this challenge.

Factors that are important to assessing potential transit usage include: group size (cost of fares); familiarity with transit service and regularity of trips to Fort Mason (city, Bay Area or other residency); mode of arrival to the city and to Fort Mason; parking, time of arrival and departure, trip purpose and Muni prepaid fare. An employee survey and a visitor intercept survey were developed to help answer these questions. The following methodology and results are associated with the visitor intercept survey.

METHODOLOGY

Respondent Universe

Fort Mason's English speaking employees, people doing business and visitors were the target population for this survey. The survey was conducted on three, non-consecutive days to provide insight into travel on a typical weekday, a typical weekend day and an event weekend day. The survey was conducted on June 16th (Saturday), 20th (Wednesday) and 23rd (Saturday). Along with the usual Fort Mason attractions, the RoboGames competition was held on Saturday, June 16, 2007, the event weekend day. This special event, which lasts the duration of the weekend, draws hundreds of competitors and viewers from all over the world. The typical weekday took place on Wednesday, June 20, 2007 and the typical weekend day took place on Saturday, June 23, 2007. The weather on all three days was typical for that time of year: cloudy and cool in the morning and sunny and windy in the afternoon.

Intercept Sampling Approach

The intercept survey approach placed surveyors with clipboards in the field (lower Fort Mason Center) to ask pedestrians to complete a survey. This intercept approach is a proactive way to get input in a defined geographic area. The surveyors were instructed to approach users who were not on their phone or engaged in activity aside from casual conversation. If the surveyor encountered a large group or family, a random sampling methodology was engaged that was based on the closest birthday to a given month for the members of the group. For example, the surveyor would request to interview the person in the first group they encountered who has a birthday closest to the month of January. The second group encountered by the surveyor would then be asked for a response from the member who has a birthday closest to February.

Instrument

A one-page, double-sided standardized survey form was developed for the intercept survey and is attached in Appendix A. These surveys were given to the surveyors along with a clipboard to be administered in the field.

Surveyors & Counters

Surveyors and counters were hired to complete the surveying task. The surveyors and counters were supervised on-site by a staff member from Wilbur Smith Associates throughout the surveying process. Surveyors were in charge of administering the survey and the counters recorded the total number of people who entered Fort Mason. These numbers were divided by the access mode into the Fort Mason Center including auto, bike, walk, and Segway.

The surveyors and counters were college-aged students from the Bay Area in their early 20s, many who are enrolled in a transportation-related program at UC Berkeley. The scheduling of surveyors was done to proportionally match the number of surveyors to the anticipated number of people at the Fort Mason. At all times during the survey period, there was a minimum of two surveyors, two counters, and one supervisor in the field. The maximum conditions (typically during midday) placed five surveyors, two counters and one supervisor in the field.

The surveyors were assigned to various quadrants of the Fort Mason Center to conduct surveys. These locations were selected to minimize the number of redundant survey inquiries by the surveyors and to target the anticipated high-use areas of the Center. This distribution technique also allowed a larger area to be covered to achieve a representative sample of trip purposes and access modes. The assigned locations of the surveyors and counters are shown in Figure 1.

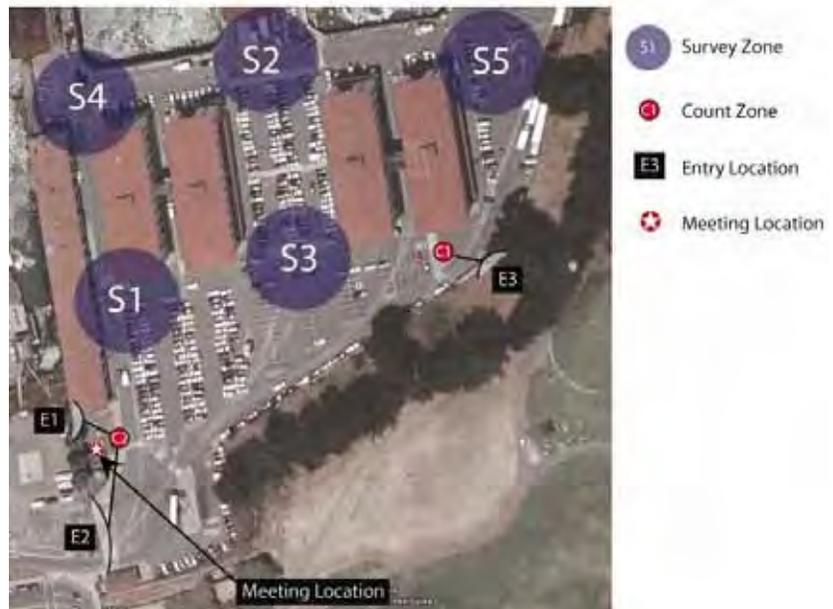


Figure 1: Surveyor and Counter Locations

Surveying Procedure

Surveyors were instructed to approach users of the Fort Mason Center and ask them if they would be interested in taking a survey. After agreeing to take the survey, the surveyor would give a short briefing on the purpose of the survey and explain the F-Line extension project using the map attached in Appendix A. The surveyor then gave the respondent the opportunity to fill out the form on their own or have them read the questions and record the responses to the respondent. The latter option was selected in the majority of surveys. Depending upon the respondent's interest in the survey, the average interview took approximately two to three minutes to administer.

Pre-testing

A pre-test of the survey methodology and instrument was completed on Thursday, March 22, 2007. Wilbur Smith Associates staff spent an hour administering the draft survey to nine random respondents at the site to obtain input on misleading or confusing questions and to gain a sense of the response rate and time to complete the survey. Comments from the pre-test relating to the procedure and the survey are listed below.

Procedural Comments

- The survey may be more efficient if the *subject* reads and fills out the form with surveyor oversight to clarify and answer questions that may arise. This options should be given following a short debriefing by the surveyor that explains the project and the purpose of the survey.
- The morning seems slow and the rush appears to occur during the lunch hour and during the evening entertainment hours. The crowds during the lunch hours seemed to more constrained for time and less willing to fill out the survey. This may also be the case during the evening entertainment rush. Staffing should be done to meet these changes in demands and willingness to partake in the survey.
- A strategy to attract the subjects to the survey, rather than opening with the question of “do you have time for a quick survey?” should be considered. Conveying that this is for the National Park system or to benefit the transit options to the area may spur more interest and increase the response rate.
- The entry points to the area appear to naturally separate the user groups and surveyors should be strategically placed to receive input from all user groups. Those accessing the area from the stair case to the south tend to be from a tourist population, those driving in to the main gate tend to a local visitor population, and those entering from the small gate opening to the west appear to be employees and/or local residents.

Form Comments

- Remove TOPIC AREA # comments on the right side of the form to avoid added confusion from the subject.
- The last sentence of the opening paragraph that gives instructions to the surveyor was removed.
- Slight rewording to question 1 to read: “Which best describes *you or your group*”
- Added text to question 5 that gives instructions to those who did not drive to the study area.
- Took away the text prior to question 14 and replaced it with text more appropriate for a self administered survey.
- The last section on page two that refers to the reason for refusal was replaced with a separate refusal log.

FINDINGS

Response Rate

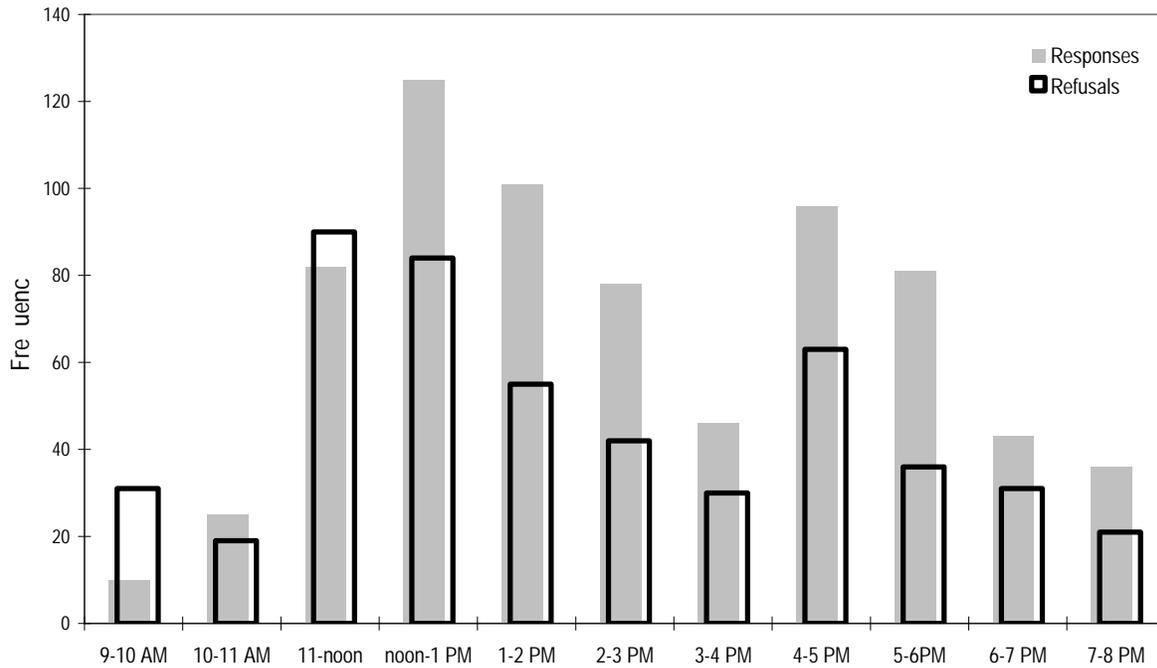
In total, 729 surveys were completed over the three day period. The overall response rate to the survey over this three day period was just under 60%. A breakdown of the responses and the refusals by day is shown in Table 1 below.

Table 1: Surveys, Refusals, and Response Rate by Day

	June 16 th (Saturday)	June 20 th (Wednesday)	June 23 rd (Saturday)	Total
	Event Weekend	Weekday	Non-Event Weekend	
# of Surveys	298	209	222	729
# of Refusals	131	213	154	498
Response Rate	69.5%	49.5%	59.0%	59.4%

The number of survey responses and refusals varied by the time of day. The morning hours often had a higher number of refusals but the afternoon was the opposite. Figure 2 shows how the response rates changed throughout the survey period.

Figure 2: Responses and Refusals By Time of Day



Using the total entry volumes that were counted during the survey period, it is estimated that 13% of all users to the Fort Mason Center were asked to take the survey and 8% of all users completed the survey. These numbers may be skewed by the amount of people who made multiple entries to Fort Mason throughout the day as observed during the survey, especially during the event weekend. These multiple entries resulted in a higher number of total users than were actually there.

Entry and Access

During the three-day period, a total of 9,593 persons were counted entering the Fort Mason Center. Over half of all entries were observed on the event weekend day. Seventy-five percent of all entries for all modes came through the main gate, 11% percent entered through the pedestrian access gate just north of the main gate, and 14% entered along the staircase connected to Upper Fort Mason.

Over half of all users to the Fort Mason Center during the three-day period walked as their primary mode of access. The automobile was the second most heavily used access mode, used by nearly 39% of the total users. Bike and Segway formed the remaining 3.5% of modes as shown in Figure 3.

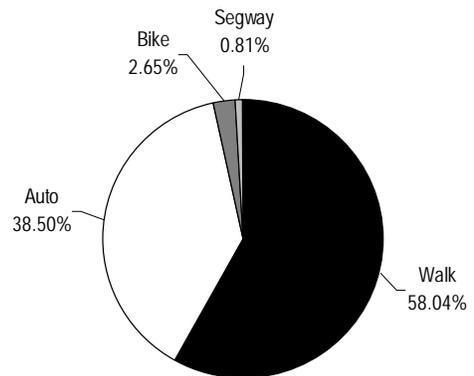


Figure 3: Access Split to Fort Mason

Based on the count totals from the three observed days, it can be estimated that the total number of trips to/from the Fort Mason Center was between 1,738 – 5,585 per day as shown in Table 2. Using these trip estimates a rough estimate of potential patronage is outlined in Table 2. The total number of trips and E-Line capture, however, must consider many other factors. These estimates simply show order of magnitude potential.

Table 2: Estimated Trips and Transit Trips

	June 16 th (Saturday)	June 20 th (Wednesday)	June 23 rd (Saturday)
	Event Weekend	Weekday	Non-Event Weekend
Entries (observed)	5,585	1,738	2,271
Total Trips (estimated)*	12,287	3,823	4,996
Total Transit Trips-Observed (estimated)**	1,720	535	700
Total Transit Trips-Verbal (estimated)***	5,529	1,720	2,248

* Estimated as entries x 2 (to account for exiting trips) and then multiplied by 1.1 (to account for trips not observed during the 9 am – 8 pm study time period.

** Based on the response rate of those who actually took transit to Fort Mason on the day of the survey (14%)

*** Based on the response rate of those who said they would take the F-Line for the trip if it was available (45%)

Survey Results

Respondents to the survey were from all parts of world but the majority were from the Bay Area and the City of San Francisco. Figure 4 geographically shows where the respondents were from based on their home zip code. Only those zip codes with more than five responses are represented in the figure.

The results to the survey strongly favored the extension of the streetcar with 87% in favor, 7% against, and 6% without a response. Forty-five percent of the respondents indicated they would have made the trip on the F-Line if the extension was available, 53% said they would not have used the extension for their trip and two percent were unsure.

Question-by-question responses can be found in Appendix B. The general findings from the study include:

- Eighty-five percent of all user groups surveyed were visitors.
- Nearly a third of all respondents were at Fort Mason to attend a one-time event, 18% were attending an ongoing class, and 13% were there to dine.
- Nearly half of all respondents came alone and less than a third traveled with one other person.
- Thirty percent were visiting from outside the Bay Area and two thirds of those were staying overnight in the Bay Area.
- Almost 2/3 of all respondents drove to Fort Mason but only 40% of those who drove parked inside the gate. Equally as many people parked just outside the gate in the free parking lot.
- Thirty-seven percent of respondents started their trip to Fort Mason outside of the City of San Francisco. Of those who started their trip outside San Francisco, 78% drove and 14% took transit.
- The four most cited Muni lines to access Fort Mason were 28 (19%), 30 (19%), 22 (18%) and 49 (15%). One person used the existing F-Line and walked and one person used the cable car and walked. Only 14% of Muni riders who participated in the study had a Fast Pass and 2% had a Muni Passport.

Cross tabs were applied to the results to determine trends in the responses by visitor type or access mode. The results of this analysis can be found in Appendix B. The following observations were made from this analysis:

- The user type (business, visitor, other) did not have an effect on the preference for the F-Line extension or the use of the F-Line if it was extended for their current trip.
- A higher percentage of those who were opposed to the F-Line extension were those who walked to Fort Mason. Higher percentages of those in favor of the extension took transit or drove.

- The highest percentage of those who stated they would take the F-Line for their trip if it was extended were those who arrived at Fort Mason by Muni.
- For visitors, the highest percentage of support for the extension by trip purpose was from those respondents attending the theatre and those sightseeing.
- For visitors, the highest percentage of respondents indicating they would use the extension for their current trip if it was running was from those dining and attending a class.
- Those attending the Fort Mason Center for business purposes had a significantly lower percentage of those who indicated they walked as their primary mode of transportation than those attending for other purposes.
- Percentage-wise, the lowest use of Muni came from those respondents dining and attending a one-time event. Sightseers had a significantly low percentage of driving and a high percentage of walkers. Those attending a regular class and the theatre had a low percentage of walkers.

GENERAL OBSERVATIONS

While the survey enabled quantification of the preferences by the different user groups, respondents were generally quite vocal on a number of secondary questions with the project. Comments from two of the surveyors are included in Appendix C which highlights some examples of their observations during the survey work.

The most discussion from the respondents seemed to arise when the surveyor reached question 12, “Should the F-Line streetcar be extended to Fort Mason?” The survey required the respondents to choose either “yes” or “no” to supporting the extension and the surveyors provided them with limited background information on the project. Many questioned the specifics of the project such as environmental impacts (traffic reduction, noise, etc.) while others were concerned with the funding sources. The “yes” response was selected more times than not when people were initially unsure.

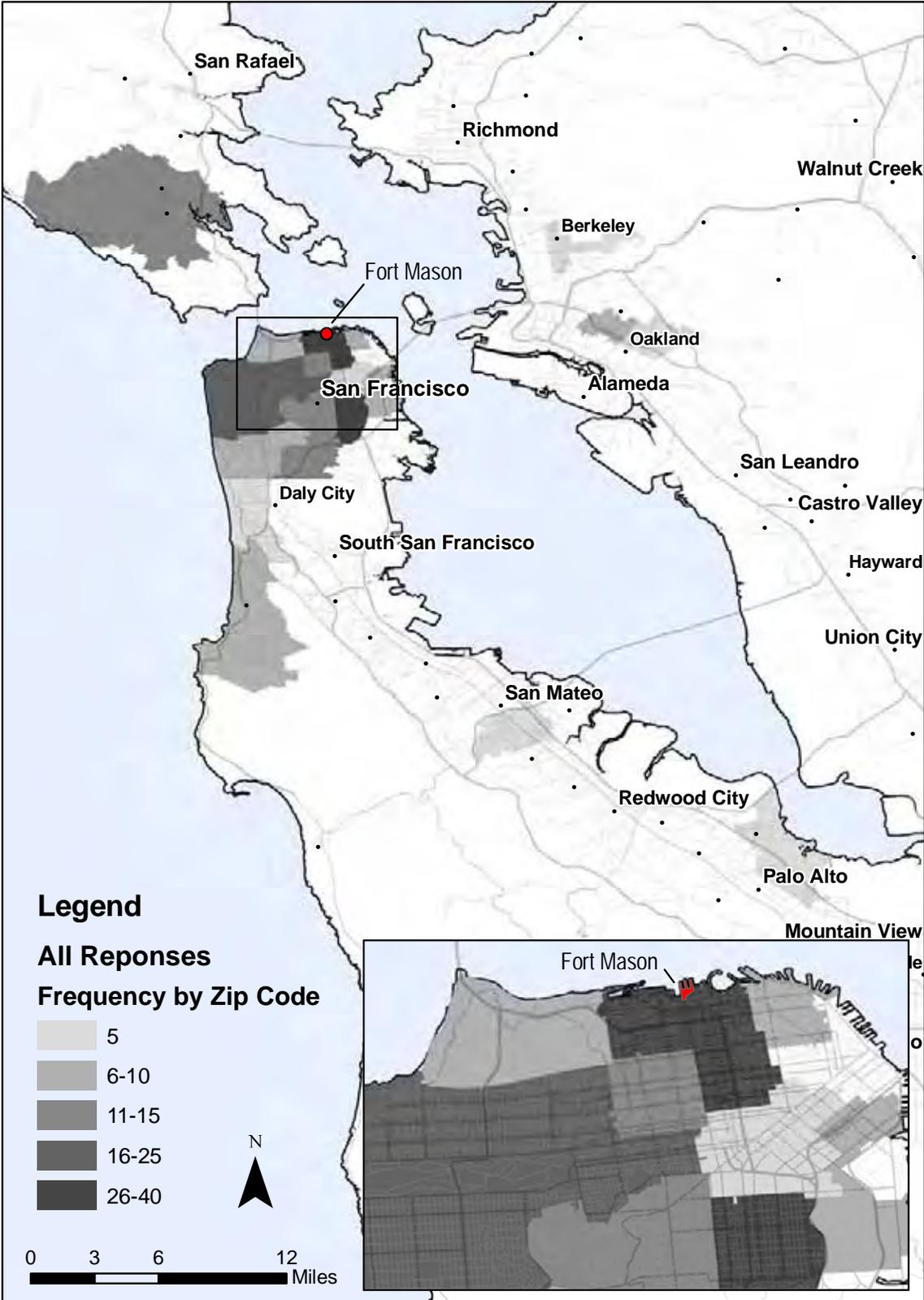


Figure 4
HOME ORIGINS OF RESPONDENTS BY ZIP CODE

APPENDIX A – SURVEY INSTRUMENT

ur e Form Pa e o



Date: _____

Time: _____

FORT MASON INTERCEPT SURVEY

The National Park Service is looking at the feasibility of extending the Muni historic streetcar service [F-line] (that now ends at Fisherman's Wharf) into Fort Mason. Would you be willing to help the NPS by answering a few questions about your interest in choosing an historic streetcar for your travel to the Fort Mason area? It will take about 4 minutes.

1a. Which best describes you or your group?

- Employed at Fort Mason
- Business at Fort Mason
- Visitor
- Other (specify) _____

1b. If you are a visitor, what is the primary purpose of your trip?

- Dine
- Theater (please specify the site/location) _____
- Attend [one-time] event (please specify the site/location) _____
- Attend class, workshop, or another ongoing program.
- If so, how many times in the past month have you come to Fort Mason for this purpose?
_____ times in the last month
- Sightseeing (please specify the site/location) _____
- Other (specify) _____

2. How many people arrived with you, including yourself, at Fort Mason today? _____

3a. What is the zip code of your home address? _____

3b. If you reside outside the Bay Area, are you staying overnight in the Bay Area for this visit?

- Yes (specify where) _____
- No

4. How did you arrive at Fort Mason today?

- Muni (specify line) _____
- Other bus operator (specify) _____
- BART
- Drove and parked car
- Got a ride from someone else and dropped off
- Taxi
- Walk
- Bike
- Other (specify) _____

5. If you drove your car, where did you park? If you did not drive, you may skip this question. (Surveyor: If necessary, show respondents the parking map.)

- Inside Fort Mason (Fort Mason parking lot) A
- Outside the gate at Fort Mason B
- Upper Fort Mason C
- Along Marina Green D
- Safeway parking lot E
- Fisherman Wharf's area G
- Near the Maritime Museum H
- Neighborhood streets I
- Other (specify) _____ J

6. If you did not begin your trip in San Francisco, how did you get to San Francisco today?

- Transit (specify mode or agency, e.g., BART, AC Transit, Golden Gate Transit, etc.) _____
- Ferry
- Car
- Other (specify) _____

Continued

¹ Letters correspond with parking spaces on Parking Map visual.

FORT MASON INTERCEPT SURVEY (Continued from previous page)

7. About what time did you arrive at the Fort Mason Center today?
_____ am/pm

8a. Other than TODAY, have you visited Fort Mason in the last 12 months?
 Yes
 No

8b. If yes, approximately how many times have you visited it during that time period?
_____ # of times in the last 12 months

9. What time do you anticipate leaving the Fort Mason Center today?
_____ am/pm

10. How many in your group have a Muni Fast Pass or Muni passport?
_____ # of people with Fast Pass
_____ # of people with Passport

The last two questions refer to the proposed extension of the historic F-line that currently terminates at Beach and Jones near fisherman's wharf. If needed, please ask the surveyor for a detailed map showing the approximate alignments of this proposed route.

11. If the F-line historic streetcar already served Fort Mason, would you have used it for this trip?
 Yes
 No

12. Should the F-line streetcar be extended to Fort Mason?
 Yes
 No

Thank you for participating in our survey.

When we have finished the surveying, a copy of the results will be available on-line at www.historicstreetcarextension.org. You can also visit this web site for more information about our project.

This survey is being administered under the Federal Paperwork Reduction Act. If you should have any further questions about why it is being done or would like to know more about it, you can contact Rick Foster at (415) 561-4472 or rick_foster@nps.gov. You can also contact the NPS Office of Social Science in Washington, DC, at (202) 513-7190.

PRIVACY ACT and PAPERWORK REDUCTION ACT statement: 16 U.S.C. 1a-7 authorizes collection of this information. This information will be used by NPS managers to better serve the visiting public. Response to this request is completely voluntary and confidential. An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid NPS permit number.

BURDEN ESTIMATE STATEMENT: Public reporting burden for this form is estimated to average 4 minutes per response.

*OMB Approval #1024-0224 (NPS #07-037)
Expiration Date: 12/01/2007*

Parking reference here used in union



E-Line Graphic



APPENDIX B – SURVEY RESULTS

Question-By-Question Summary

Q1a: What best describes you or your group?

	16-Jun	20-Jun	23-Jun	o a	Percentage
No response	2	3	7		2%
Business	12	16	11		5%
Visitor	257	172	190		85%
Other	27	18	14		8%
Total	298	209	222		100%

Q1b: If visitor, primary purpose of trip?

	16-Jun	20-Jun	23-Jun	o a	Percentage
No response	3	11	6		3%
Dine	6	30	44		13%
Theater	2	4	15		3%
Attend 1-time event	159	13	24		32%
Attend class	16	55	41		18%
Sightseeing	21	17	33		11%
Other	50	42	27		19%
Total	257	172	190		100%

Q2: How many people arrived with you including yourself?

	16-Jun	20-Jun	23-Jun	o a	Percentage
No response	6	6	7		3%
Alone	93	135	105		46%
Two	108	43	71		30%
Three	31	10	20		8%
Four	32	7	13		7%
5+	27	8	7		6%
Total	297	209	223		100%

Q3: Home zip code?
See Figure 4 above

Q3b: Outside Bay Area, staying overnight?

	16-Jun	20-Jun	23-Jun	o a	Percentage
No response	165	162	180		
Yes	82	29	27		62%
No	51	18	15		38%
Total	298	209	222		100%

Q4: How did you arrive?

	16-Jun	20-Jun	23-Jun	o a	Percentage
No response	3	5	1		1%
Muni	28	30	25		11%
Other bus	1	2	1		1%
BART	5	5	1		2%
Drove & parked	189	127	137		62%
Dropped off	6	3	5		2%
Taxi	9	1	4		2%
Walk	50	26	34		15%
Bike	5	7	11		3%
Other	2	3	3		1%
Total	298	209	222		100%

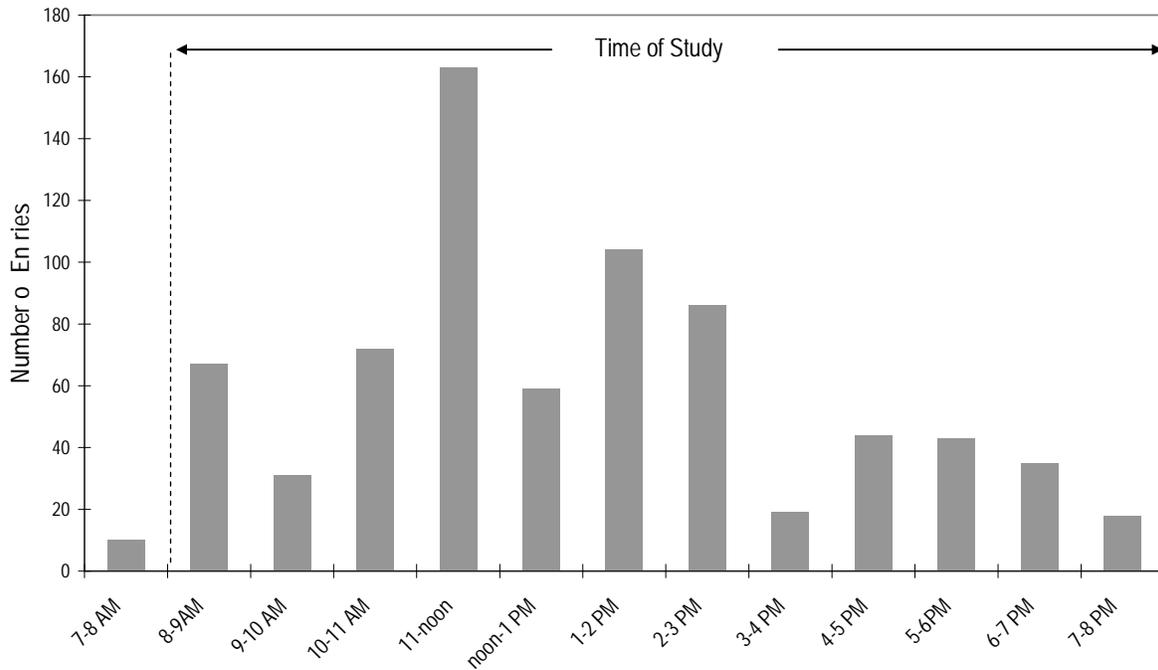
Q5: If you drove, where did you park?

	16-Jun	20-Jun	23-Jun	o a	Percentage
No response	2	1	0		1%
Inside Fort Mason	79	60	44		40%
Outside the gate	59	55	65		40%
Upper Fort Mason	5	3	2		2%
Along Marina Green	21	7	16		10%
Safeway	4	1	1		1%
Fisherman Wharf	0	0	0		0%
Near Maritime Museum	0	0	0		0%
Neighborhood	17	0	8		6%
Other	2	0	1		1%
Total	189	127	137		100%

Q6: How did you get to SF today?

	16-Jun	20-Jun	23-Jun	o a	Percentage
No response	141	165	154		
Transit	20	7	11		14%
Ferry	1	1	0		1%
Car	119	34	56		78%
Other	17	2	1		7%
Total	137	37	57		100%

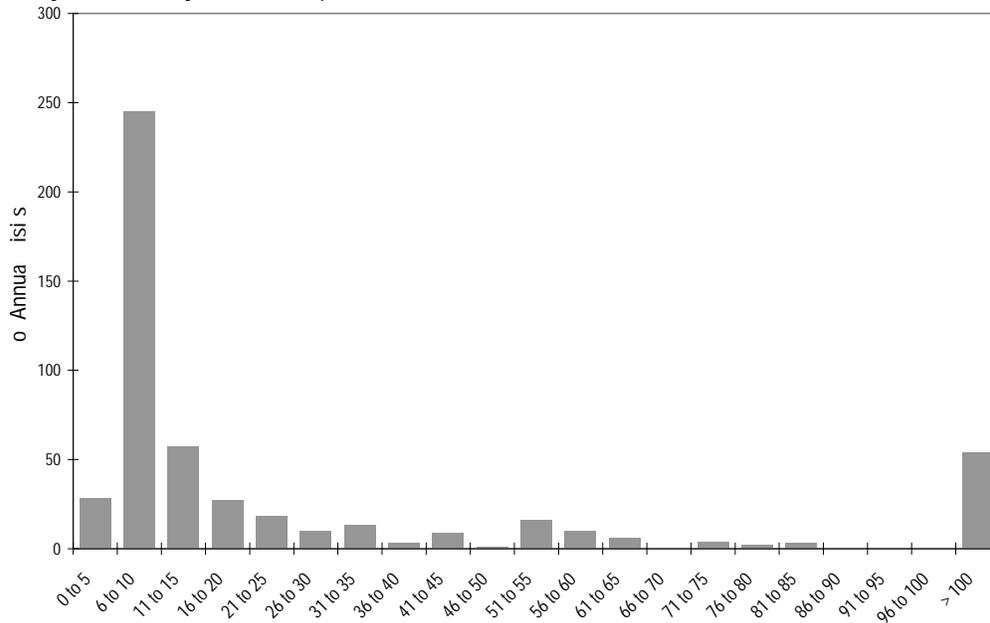
Q7: What time did you arrive?



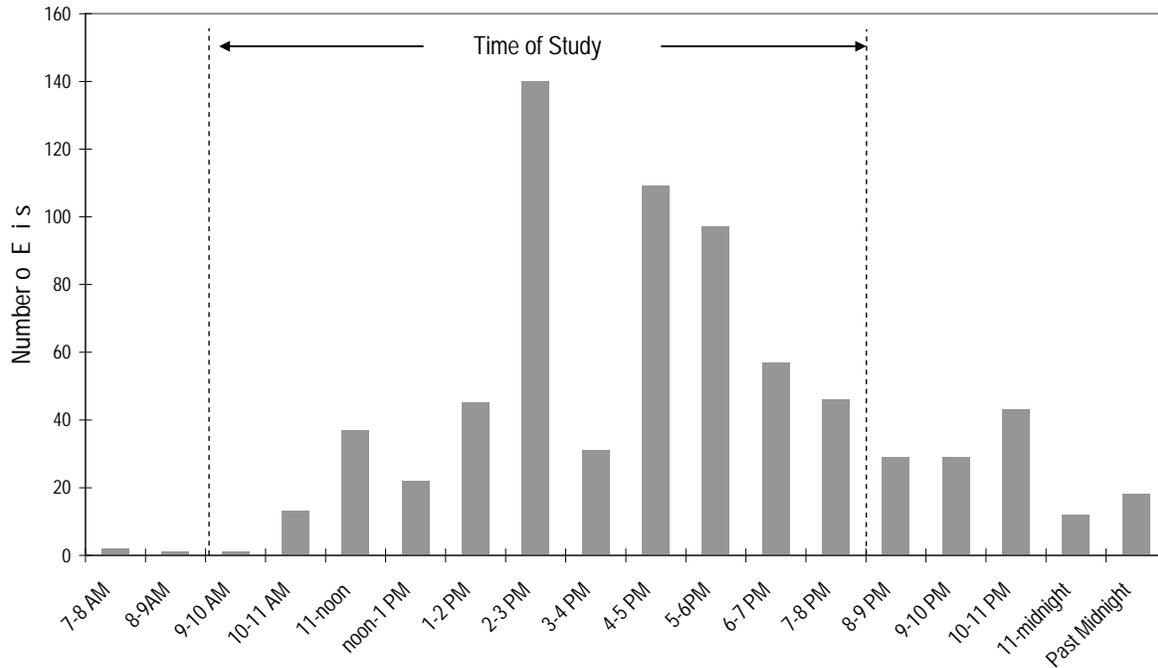
Q8a: Have you visited in last 12 months?

	16-Jun	20-Jun	23-Jun	o a	Percentage
No response	10	8	2		3%
Yes	150	149	163		63%
No	138	52	57		34%
Total	298	209	222		100%

Q8b: If yes, how many times in the past 12 months?



Q9: What time do you anticipate leaving?



Q10: How many in group have a Fast Pass?

	16-Jun	20-Jun	23-Jun	o a	Percentage
No response	7	11	70		12%
Zero	257	170	114		74%
One	26	26	33		12%
Two	6	2	5		2%
Three	2	0	0		0%
Total	298	209	222		100%

Q10: How many have Passport?

	16-Jun	20-Jun	23-Jun	o a	Percentage
No response	9	10	91		15%
Zero	288	190	130		83%
One	0	5	0		1%
Two	1	3	1		1%
Three	0	1	0		0%
Total	298	209	222		100%

Q11: If the F-Line already served Fort Mason would you have used it?

	16-Jun	20-Jun	23-Jun	o a	Percentage
No response	7	9	1		2%
Yes	144	99	86		45%
No	147	101	135		53%
Total	298	209	222		100%

Q12: Should the F-Line be extended?

	16-Jun	20-Jun	23-Jun	o a	Percentage
No response	17	14	9		6%
Yes	266	176	195		87%
No	15	19	18		7%
Total	298	209	222		100%

Cross-Tab Analysis Summary

Q1a: What best describes you or your group? he F-Line a read ser ed For ason ou d ou ha e used i

	es	%	No	%
No response		1.8%		1.6%
Business		5.5%		5.0%
Visitor		85.7%		85.1%
Other		7.0%		8.4%
Total		100.0%		100.0%

Q1a: What best describes you or your group? hou d he F-Line be e ended

	es	%	No	%
No response		1.7%		1.9%
Business		5.8%		3.8%
Visitor		85.1%		80.8%
Other		7.4%		13.5%
Total		100.0%		100.0%

Q4: How did you arrive? a ha bes describes ou or our roup

	Business	%	isi or	%	her	%
No response		0.0%		1.1%		1.7%
Muni		17.9%		10.8%		10.2%
Other bus		0.0%		0.6%		0.0%
BART		2.6%		1.5%		1.7%
Drove & parked		59.0%		62.8%		57.6%
Dropped off		5.1%		1.9%		0.0%
Taxi		5.1%		1.5%		5.1%
Walk		2.6%		15.8%		16.9%
Bike		7.7%		2.7%		5.1%
Other		0.0%		1.1%		1.7%
Total		100.0%		100.0%		100.0%

Q4: How did you arrive? b isi or primar purpose o rip

	Dine	%	hea er	%	E en	%	C ass	%	i h seen	%	her	%
No response		0.0%		0.0%		1.0%		0.0%		0.0%		4.2%
Muni		8.8%		14.3%		8.7%		15.2%		14.1%		10.9%
Other bus		1.3%		0.0%		0.5%		0.0%		0.0%		0.8%
BART		1.3%		0.0%		2.0%		1.8%		0.0%		1.7%
Drove & parked		65.0%		71.4%		69.4%		70.5%		42.3%		54.6%
Dropped off		1.3%		0.0%		1.5%		2.7%		0.0%		4.2%
Taxi		2.5%		4.8%		2.6%		0.0%		0.0%		0.8%
Walk		16.3%		9.5%		11.7%		5.4%		39.4%		18.5%
Bike		3.8%		0.0%		2.0%		2.7%		4.2%		2.5%
Other		0.0%		0.0%		0.5%		1.8%		0.0%		1.7%
Total		100%		100%		100%		100%		100%		100%

Q4: How did you arrive? a o man in roup ha e a Fas Pass

	ero	%	ne	%	o	%	hree	%
No response		1.3%		2.4%		0.0%		0.0%
Muni		9.4%		22.4%		30.8%		100.0%
Other bus		0.4%		1.2%		7.7%		0.0%
BART		1.8%		0.0%		0.0%		0.0%
Drove & parked		65.1%		43.5%		53.8%		0.0%
Dropped off		1.7%		3.5%		0.0%		0.0%
Taxi		1.7%		4.7%		0.0%		0.0%
Walk		14.8%		16.5%		7.7%		0.0%
Bike		3.0%		4.7%		0.0%		0.0%
Other		0.9%		1.2%		0.0%		0.0%
Total		100.0%		100.0%		100.0%		100.0%

Q4: How did you arrive? b o man ha e Passpor

	ero	%	ne	%	o	%	hree	%
No response		1.5%		0.0%		0.0%		0.0%
Muni		11.2%		16.7%		20.0%		0.0%
Other bus		0.3%		16.7%		20.0%		0.0%
BART		1.6%		0.0%		0.0%		0.0%
Drove & parked		62.5%		16.7%		0.0%		100.0%
Dropped off		1.8%		0.0%		20.0%		0.0%
Taxi		2.1%		0.0%		0.0%		0.0%
Walk		15.0%		33.3%		20.0%		0.0%
Bike		3.0%		16.7%		20.0%		0.0%
Other		1.0%		0.0%		0.0%		0.0%
Total		100.0%		100.0%		100.0%		100.0%

Q4: How did you arrive? he F-Line a read ser ed For ason ou d ou ha e used i

	es	%	No	%
No response		1.5%		1.0%
Muni		17.3%		6.5%
Other bus		0.3%		0.8%
BART		2.4%		0.8%
Drove & parked		55.9%		67.4%
Dropped off		0.9%		2.9%
Taxi		4.0%		0.3%
Walk		13.7%		15.9%
Bike		3.0%		3.1%
Other		0.9%		1.3%
Total		100.0%		100.0%

Q4: How did you arrive? hou d he F-Line be e ended

	es	%	No	%
No response		1.1%		1.9%
Muni		11.6%		7.7%
Other bus		0.6%		0.0%
BART		1.4%		3.8%
Drove & parked		62.6%		55.8%
Dropped off		1.9%		1.9%
Taxi		2.2%		0.0%
Walk		14.4%		23.1%
Bike		3.1%		3.8%
Other		0.9%		1.9%
Total		100.0%		100.0%

Q11: If the F-Line already served Fort Mason would you have used it? b isi or primar purpose o rip

	Dine	%	hea er	%	E en	%	C ass	%	i h seein	%	her	%
No response		0.0%		0.0%		0.5%		3.6%		0.0%		3.4%
Yes		58.8%		42.9%		53.6%		55.4%		43.7%		53.8%
No		41.3%		57.1%		45.9%		41.1%		56.3%		42.9%
Total		100%		100%		100%		100%		100%		100%

Q12: Should the F-Line be extended? / b isi or primar purpose o rip

	Dine	%	hea er	%	E en	%	C ass	%	i h seein	%	her	%
No response		6.3%		0.0%		6.6%		4.5%		0.0%		10.1%
Yes		86.3%		95.2%		89.3%		87.5%		93.0%		79.0%
No		7.5%		4.8%		4.1%		8.0%		7.0%		10.9%
Total		100%		100%		100%		100%		100%		100%

APPENDIX C – SURVEYOR OBSERVATIONS

Surveyor 1:

Throughout the surveying time, it was clear the majority of people were in favor of the extension. Tourists traveling on foot mainly supported this extension and overall would have used it that day to get to the center. Those who came from the Bay Area, but outside San Francisco, were somewhat indifferent to the extension. Since they would have been driving regardless, there was no need for them to use the proposed line. These Bay Area residents usually said “yes” to extend the line simply because they thought it would create more cohesion between Fisherman’s Wharf and the Fort Mason Center.

The only qualms about the additional add-on came from a small number of neighboring residents regarding financial issues. Tourists seemed to like the idea after most of them lamented about having to walk from Fisherman’s Wharf to the Fort Mason Center. They expressed support of the line because they thought it would create more connectivity between two tourist attractions and essentially bring more people to the area. This also seemed to have an effect on how residents felt. I remember one surveyed resident discussed how it would make the area a tourist trap and bring too many people to the center.

Other residents overall had more of a positive perception of the extension saying that bringing more people to the area would be good, and only questioned cost. Some could not make a decision based on the facts that were presented and wanted more information before committing to support the Muni extension. Even with this said, most residents said they probably would have used it that day to get to the center. It seems the idea of extending the line was received very well, but there are still some details that need to get addressed for residents to be in full support. Also, for one-time tourists to use the line, I think it would be beneficial to create signage around Fisherman’s Wharf typically for tourists to draw them to the Center.

Surveyor 2:

While surveying at Fort Mason, I got a lot more detailed responses than I could really capture in the surveys alone. For instance, a local member of the Dolphin swim club said that he was not opposed to the extension, as long as it didn’t interfere or contaminate the Aquatic Park in any way. He said that as long as the Aquatic Park was completely conserved, the whole Dolphin club would support the extension.

Several survey respondents mentioned that they were concerned about the level of noise and tourists that the train would bring, because part of the charm of Fort Mason is its quiet, local appeal. Oftentimes, these comments would enter the survey conversation as jokes, and then be rebuffed in favor of public transportation and sharing the historic space.

I had one local couple tell me that they refused to take the survey until Fort Mason removed its parking charges. They were genuinely offended that the park would force people to pay, especially because they were paying high taxes to enjoy the park already. Several other local people mentioned their distaste for the parking charges as well.

Two local men also told me that they didn’t want to see Fort Mason extended until they saw the rest of the Muni lines fixed up first. Apparently, the T line is in terrible working condition, and so they wanted to fix what we already had before starting new projects. Concerns about funding were also frequently voiced.

One of the most common responses from survey respondents was that they just didn’t know. They weren’t especially familiar with the possible extension, where funding was coming from, or what the environmental (both nature and aesthetics) would be. They were wary of making the decision, but felt compelled to choose

“yes” or “no” because there were only two options on the survey. I’d say that the majority of the time, these people chose “yes” because they were ultimately in favor of public transit systems, and maybe because they wanted to please the surveyor.

One of the biggest “yes” respondents was tourists. Many of them were staying downtown or traveling from downtown BART stations, and so they wished they had been able to use the historic streetcar to get out to Fort Mason. Many of these people also joked about how they weren’t going to pay the taxes, so why not?

Overall, the responses for the extension to Fort Mason were overwhelmingly positive. Survey respondents may have felt compelled to choose “yes” to the extension in order to please the surveyors, but I think that in general, people chose “yes” most of the time because they were generally in favor of good public transit systems. Many people simply said, “Well yes, if it makes it easier for people to get around.” Some mentioned traffic reductions as another benefit of the extension. Many people were in favor of the extension, even though they admitted that they wouldn’t have used it that same day, usually because they were carrying supplies or equipment. Many locals got very excited on the last question because they were so emphatic about its benefits.

Appendix H
Wye Terminal Operations Memorandum

NPS Historic Streetcar Extension Record of Interview

Subject: Muni PCC car wye terminal operations

Interviewee: Angelo Figone – former Muni Supt of Schedules and Rail Operations

Interviewer: Duncan Watry (URS)

Date: 11/25/08

SF Muni formerly operated wye terminals used by PCC cars at several locations around the city. Three factors governed how quickly cars could be turned around at these terminals:

1. Whether or not there are spring switches in the OHL frogs
2. Whether the tail tracks were double track or single track
3. If the reverse move was crossing a major street

Examples:

30/Judah, 35/Taraval

- hand throw switch into wye from OB track
- Simple wye – single tail track
- 2 spring switches in track – one on top leg of wye and one on inbound track
- Spring frogs in OHL
- Backpoled through spring frogs
- Designed for fast operations
- 2 minutes

11th/Market

- Electric track switch diverge into wye
- No spring frogs in OHL – so operator needed to change poles twice for reverse move and then again for forward
- 3 minutes

30/Church – original configuration

- 2 minutes

Tail tracks designed for more than one PCC

Times from 1981 -last regular PCC schedules