

**RED COLORED TRANSIT-ONLY LANES
REQUEST TO EXPERIMENT**

Submitted to:

California Traffic Control Devices Committee
Federal Highway Administration, Office of Traffic Operations

Submitted by:

San Francisco Municipal Transportation Agency

June 29, 2012

BACKGROUND

The San Francisco Municipal Transportation Agency (SFMTA) oversees the surface transportation system in San Francisco, including operation of the San Francisco Municipal Railway (Muni). Muni is one of America's oldest public transit systems, and the seventh largest system in the United States, carrying more than 200 million customers annually on approximately 80 routes throughout San Francisco. The Muni route network includes approximately 15 miles of streets with transit-only lanes. As part of ongoing initiatives to improve Muni service, the SFMTA is seeking improvements to the operation of transit-only lanes. The SFMTA is also evaluating the addition of new transit-only lanes at various along the Muni route network. This request for experimentation is for the use of red colored transit-only lanes along the Muni route network.

NATURE OF THE PROBLEM

Transit-only lanes can reduce transit travel times and improve transit service reliability by allowing transit vehicles to bypass traffic congestion and avoid conflicts with other vehicles in mixed travel lanes. Non-transit vehicles are typically permitted to enter transit-only lanes to access curbside parking or to complete a turn, unless specifically prohibited. However, non-transit vehicles frequently violate transit-only lane restrictions by traveling along or double-parking in transit-only lanes. Transit-only lane violations can cause transit vehicles to slow down to merge into adjacent lanes or stop to wait for the transit-only lane to clear, contributing to longer transit travel times, reduced service reliability and reduced customer safety and comfort. Given limited enforcement resources, the SFMTA seeks to reduce violations of transit-only lane restrictions by making existing and future transit-only lanes more self-enforcing. Appendix A includes photos of various transit-only lane configurations in San Francisco.

PROPOSAL

The SFMTA proposes experimenting with red colored transit-only lanes to determine if they reduce violations of transit-only lane restrictions and reduce delays to transit vehicles.

Transit-only lanes in San Francisco generally include pavement messages indicating the class of vehicles permitted to use the lanes (examples include "BUS ONLY" and "BUS TAXI ONLY") and signs indicating when the transit-only regulation is effective. Some transit-only lanes in San Francisco include diamond symbol pavement markings. The California Manual on Uniform Traffic Control Devices, 2012 Edition (CA MUTCD) provides guidance for preferential lane word, symbol and longitudinal markings, but does not provide specific guidance for the use of colored preferential lanes. Section 3G.01 of the CA MUTCD states:

"If colored pavement is used within the traveled way, on flush or raised islands, or on shoulders to regulate, warn, or guide traffic or if retroreflective colored pavement is used, the colored pavement is considered to be a traffic control device and shall be limited to the following colors and applications:

A. Yellow pavement color shall be used only for flush or raised median islands separating traffic flows in opposite directions or for left-hand shoulders of roadways of divided highways or one-way streets or ramps.

B. White pavement color shall be used for flush or raised channelizing islands where traffic passes on both sides in the same general direction or for right-hand shoulders.

Colored pavements shall not be used as a traffic control device, unless the device is applicable at all times."

This request for experimentation is for the use of red colored transit-only lanes as a new traffic control device, including both full-time transit-only lanes and part-time transit-only lanes. The SFMTA anticipates that adding red colored treatments to transit-only lanes will improve compliance with existing restrictions and reduce delays to transit vehicles.

SUPPORTING DATA

The Transportation Association of Canada completed a survey of international cities using colored transit-only lanes in 2009 titled "Transit Lane Conspicuity through Surface Treatment: Knowledge Base." Many of the cities surveyed did not have formal evaluations of the effectiveness of colored transit-only lanes, but reductions in violations were reported in several cities, including Auckland, New Zealand; Brisbane, Australia; Edinburgh, United Kingdom; Ottawa, Canada and Sydney, Australia. Most of the cities surveyed

used red for colored bus lanes.

RELATED FHWA STUDIES

The New York City Department of Transportation (NYCDOT) completed a Federal Highway Administration (FHWA) sponsored study of red colored bus lanes in 2011. The FHWA experiment title is "3-198(Ex) - Colored Pavement for Bus Lanes - NY City." The NYCDOT study evaluated the effect of red treatments on bus travel times, illegal bus lane occupancy by non-bus vehicles, legal parking behaviour in red bus lanes during non-bus lane hours and non-bus vehicle right-turning behaviour. Highlights from the NYCDOT study include:

- Reduced illegal driving in bus lanes after installation of red treatment.
- Reduced illegal standing (under 30 minutes) in bus lanes after installation of red treatment.
- Increased illegal parking (over 30 minutes) in bus lanes after installation of red treatment¹.
- No significant change in bus travel times after installation of red treatment².
- No impact on legal parking behaviour when the bus lane is not in effect.
- No impact on legal right-turn behaviour.
- Easier enforcement of bus lane violations after installation of red treatment.

The NYCDOT study showed positive results but was based on relatively small samples.

MATERIAL DETAILS

NYCDOT in conjunction with Penn State University completed an evaluation of nine red bus lane treatment products in 2012. Materials were tested for durability and friction both in the lab and in the field. Field observations of color, susceptibility to dirt and grime and ease of patching were also conducted and lifecycle costs were estimated. The evaluation concluded that epoxy-based paints, epoxy/aggregate treatments, and asphalt concrete micro surface treatments provided the best durability. The evaluation also concluded that aggressive pre-treatment of asphalt roadways, including shot-blasting and crack repair, was necessary prior to application of colored treatments to ensure durability. The San Francisco Department of Public Works (SFPD) in conjunction with the SFMTA, is currently testing colored treatment products for bicycle facilities and may use this testing to inform material choices for this red colored transit-only lane experiment. The SFPD and the SFMTA are currently evaluating four products (three epoxy-based materials and one acrylic-based material) for visibility, durability and ease of installation.

¹ NYCDOT report notes increase in illegal parking based on very small sample size before and after red treatment installation. Average of 1.4 incidents per block face over a 3-hour period in before sample and average of 1.8 incidents per block face over a 3-hour data collection period in after sample.

² NYCDOT report notes few buses used bus lanes during study period.

EVALUATION PLAN

The SFMTA proposes evaluating red colored transit-only lanes by collecting before and after observational data of transit-only lane violations and before and after data of Muni vehicle travel times.

DATA COLLECTION

The SFMTA proposes manually observing the operation of transit-only lanes before and after installation of red treatments. Each experimental location will be observed multiple times during peak activity periods (typically on weekdays during the hours of approximately 7am-9am and 4pm-6pm). User surveys of motorists, transit vehicle operators and transit customers may also be utilized to collect information on user perceptions of the meaning and effectiveness of the red treatments. Before and after data to be collected includes:

Before/After Data	Unit of Measure
Traffic counts	Vehicles per hour
Illegal motor vehicle travel within transit-only lanes	Vehicles per hour traveling within transit-only lanes, excluding vehicles making legal turning or parking maneuvers Percentage of through-moving vehicles traveling within transit-only lanes
Illegal parking within transit-only lanes	Parking infractions per hour
Parking occupancy adjacent to transit-only lanes	Percentage of legal parking spaces occupied
Vehicle turning behavior	Turning vehicles per hour per approach lane

In addition to manual data collection, the SFMTA proposes to measure before and after transit travel times using automated passenger counters (APC). Approximately 30 percent of the SFMTA's bus fleet is equipped with APC units and these vehicles are rotated regularly throughout the system to ensure adequate coverage of every bus route. The APC units use on-board sensors and a global positioning system (GPS) to record travel times between transit stops and customer activity at each transit stop.

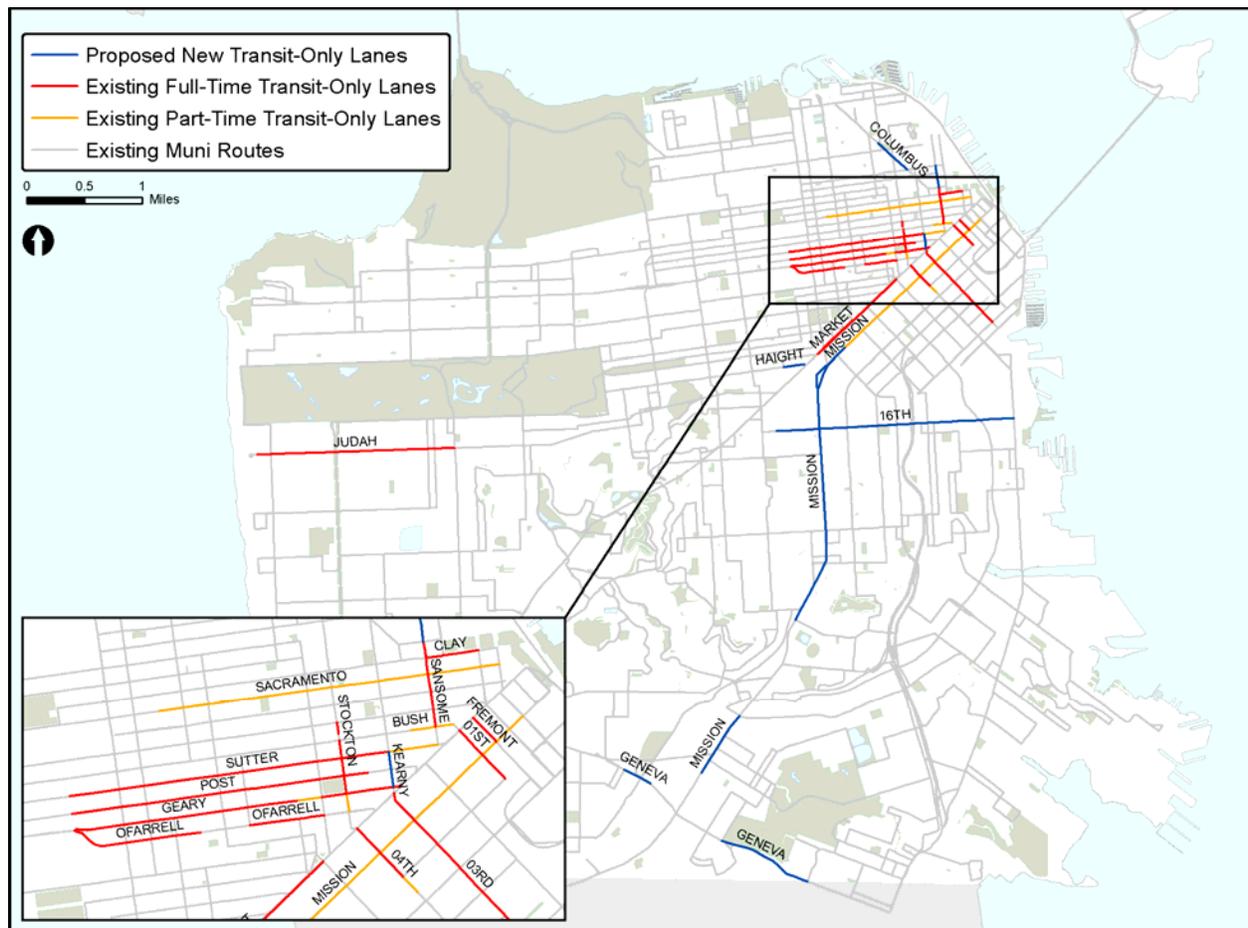
SCHEDULE

The following timeline assumes that permission to experiment is granted by the California Traffic Control Devices Committee (CTCDC) and FHWA by September 2012:

Time Period	Activity
May-September 2012	Material testing
September-December 2012	Material procurement
September-December 2012	Before data collection
Spring 2013	Install red treatments
September-December 2013	After data collection
Summer 2014	Submit final report to CTCDC and FHWA

LOCATIONS

The map below shows the locations of existing and proposed transit-only lanes in San Francisco where red treatments may be applied.



The table below provides details for existing transit-only lanes in San Francisco where red treatments may be applied.

Transit-Only Lane Location	Hours of Operation	Typical Configuration
1 st Street from Market to Howard streets	All Times	Left-side transit-only lane in one direction adjacent to curb or on-street parking on one-way street (Starting in February 2011, transit-only lane is temporarily removed to accommodate construction).
3 rd Street from Townsend to Market streets	All Times	Right-side transit-only lane in one direction adjacent to curb or on-street parking on one-way street, with right-turn pockets approaching some intersections
4 th Street from Market to Clementina streets	All Times from Market to Howard streets 3-7PM, Monday-Friday from Howard to Clementina streets	Right-side transit-only lane in one direction adjacent to curb or on-street parking on one-way street, with right-turn pockets approaching some intersections

Transit-Only Lane Location	Hours of Operation	Typical Configuration
Bush Street from Montgomery to Battery streets	7-9AM and 3-7PM, Monday-Friday	Right-side or left-side transit-only lane in one direction adjacent to curb on one-way street, with parking permitted when transit-only restriction is not in effect
Clay Street from Powell to Battery streets	All Times from Leidesdorff to Davis streets 7-9AM and 3-6PM from Kearny to Leidesdorff streets 7-9AM, Monday-Friday from Powell to Kearny streets	Right-side transit-only lane in one direction adjacent to curb or right-turn only lane on one-way street, with parking permitted along some segments when transit-only restriction is not in effect
Fremont Street from Mission to Market streets	All Times	Left-side transit-only lane in one direction adjacent to curb or on-street parking on one-way street
Geary Street from Market to Gough streets	All Times from Market to Powell streets and from Mason to Gough streets 4-6PM, Monday-Friday from Mason to Powell streets	Right-side transit-only lane in one direction adjacent to on-street parking on one-way street, with right-turn pockets approaching some intersections
Judah Street from 20 th Avenue to La Playa Street	All Times	Center-running transit-only lanes in both directions on two-way street
Market Street	All Times from 12 th to 5 th streets inbound and from 8 th Street to South Van Ness Avenue outbound	Center-running transit-only lane in one or both directions on two-way street
Mission Street from 11 th to Main streets	7AM-6PM, Monday-Friday from 5 th to Beale streets inbound 7AM-6PM, Monday-Friday from Main to 4 th streets outbound 7-9AM and 4-6PM, Monday-Friday from 11 th to 5 th streets inbound 4-6PM, Monday-Friday from 4 th to 11 th streets outbound	Center-running transit-only lane in one or both directions on two-way street

Transit-Only Lane Location	Hours of Operation	Typical Configuration
O'Farrell Street from Gough to Powell streets	All Times	Right-side transit-only lane in one direction adjacent to curb or on-street parking on one-way street, with right-turn pockets approaching some intersections
Post Street from Gough to Grant streets	All Times	Right-side transit-only lane in one direction adjacent to on-street parking on one-way street
Potrero Avenue (NB) from 24 th to 22 nd streets	All Times	Right-side transit-only lane in one direction adjacent to bicycle lane on two-way street
Sacramento Street from Drumm to Larkin streets	7AM-7PM, Monday-Friday from Drumm to Kearny streets	Right-side transit-only lane adjacent to curb on one-way street, with parking permitted when transit-only restriction is not in effect
	4-6PM, Monday-Friday from Kearny to Larkin streets	
Sansome Street (SB) from Washington to Bush streets	All times	Right-side transit-only lane in one direction adjacent to commercial loading zones in contraflow direction on one-way street, with transit vehicle, commercial vehicle, and bicycle access permitted in contraflow direction
Stockton Street from Bush to O'Farrell streets	All Times from Bush to Geary streets	Center-running transit-only lane in one direction between through travel lanes and right-turn only lanes on one-way street
	7AM-7PM, Monday-Saturday from Geary to O'Farrell streets	
Sutter Street from Sansome to Gough streets	All Times from Kearny to Gough streets	Right-side transit-only lane in one direction adjacent to on-street parking on one-way street, with right-turn pockets approaching some intersections
	3-6PM, Monday-Friday from Sansome to Kearny streets	

REPORTING

The SFMTA will submit semiannual progress reports to the CTCDC and FHWA's Office of Transportation Operations for the duration of the experiment and will submit a final report within three months following completion of the experiment.

ADMINISTRATION

The SFMTA will be the sponsoring agency and consultant services may be used as needed. The concept of red colored transit-only lanes is not protected by patent or copyright.

REMOVAL OF EXPERIMENTAL INSTALLATIONS

The SFMTA will remove experimental installations within three months of a determination by the CTCDC or the FHWA that changes to the MUTCD or CA MUTCD are not warranted. Additionally, the SFMTA will terminate the experiment if significant safety concerns are found to be attributable to the experiment.

APPENDIX A
EXAMPLES OF TRANSIT-ONLY LANES IN SAN FRANCISCO
(All images from maps.google.com)



Looking North on 3rd Street toward Harrison Street - Transit-Only Lane All Times



Looking North on 4th Street toward Market Street - Transit-Only Lane All Times



Looking East on Bush Street toward Sansome Street - Transit-Only Lane 7-9AM and 3-7PM



Looking East on Clay Street toward Montgomery Street - Transit-Only Lane 7-9AM and 3-6PM



Looking North on Fremont Street toward Market Street - Transit-Only Lane All Times



Looking West on Geary Street toward Jones Street - Transit-Only Lane All Times



Looking West on Judah Street toward 22nd Avenue - Transit-Only Lanes All Times



Looking East on Market Street toward 10th Street - Transit-Only Lanes All Times



Looking West on Mission Street toward 8th Street - Transit-Only Lanes 7-9AM and 4-6PM Westbound; 4-6PM Eastbound



Looking East on O'Farrell Street toward Larkin Street - Transit-Only Lane All Times



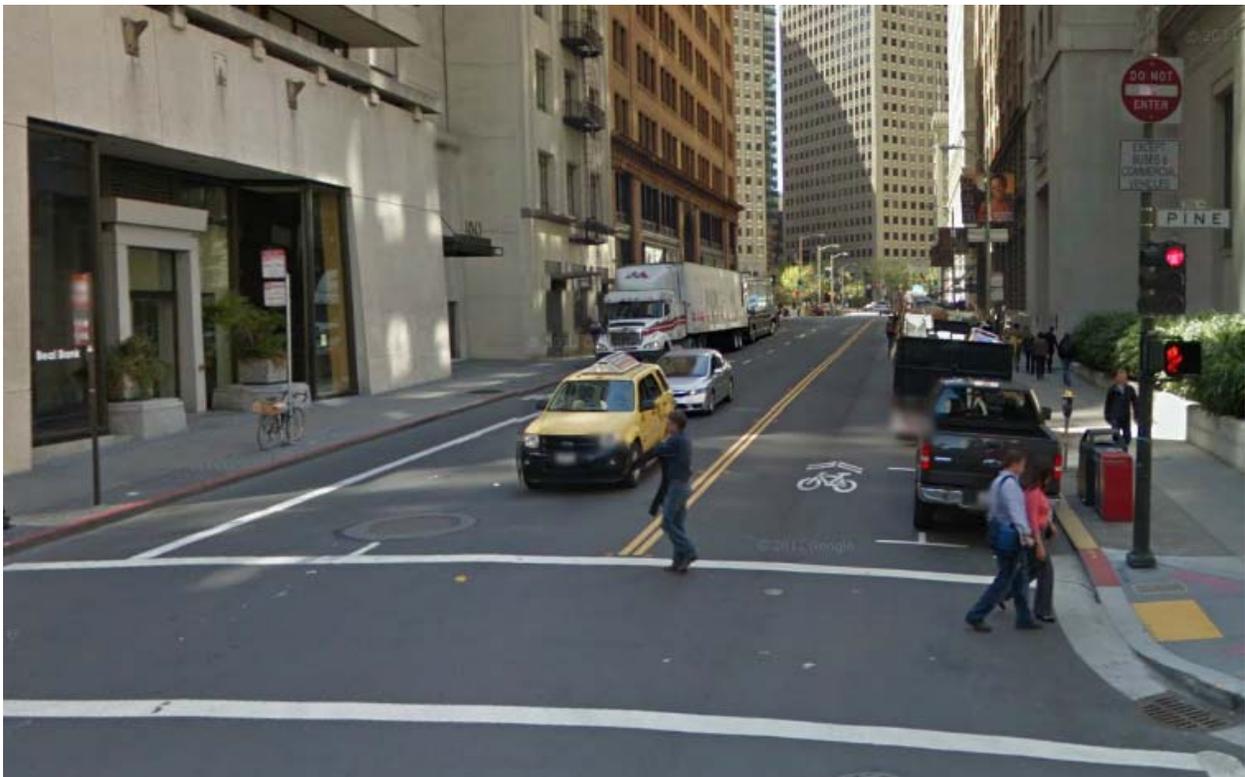
Looking West on Post Street toward Mason Street - Transit-Only Lane All Times



Looking North on Potrero Avenue toward 22nd Street - Transit-Only Lane All Times



Looking West on Sacramento Street toward Battery Street - Transit-Only Lane 7AM-7PM



Looking South on Sansome Street at Pine Street - Transit-Only Lane All Times



Looking South on Stockton Street toward Sutter Street - Transit-Only Lane All Times



Looking South on Sutter Street toward Jones Street - Transit-Only Lane All Times