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TECHNICAL MEMORANDUM

Date: July 24, 2009

To: Adam Varat and Ilaria Salvadori, City of San Francisco

From: Colin Burgett, Fehr & Peers

Subject: ***Intersection Level of Service Analysis of Potential Mission Streetscape Plan Improvements***

SF09-0447

This memorandum provides an intersection level of service (LOS) analysis of potential "four-to-three" lane conversions on three *Mission Streetscape Plan* (MSP) corridors: Bryant Street, Folsom Street and South Van Ness Avenue, between 15th and 26th Streets.

The findings of this analysis are intended to complement the conceptual analysis of potential MSP improvements provided by Nelson/Nygaard Consulting Associates[1]. In addition to evaluating potential traffic LOS impacts to key intersections on the affected corridors, the analysis also assesses whether potential "four-to-three" lane conversions on those streets could result in significant transportation impacts to parallel corridors, including Mission Street, and/or delays to transit service.

SUMMARY OF FINDINGS

Alternative 1 (Folsom Street)

The analysis of Alternative 1 is provided on pages 18-24 of this memorandum. Key findings are as follows:

Folsom Street (17th to 26th Street):

- Implementation of the proposed "four-to-three" conversion on the portion of Folsom Street between 17th and 26th Streets is not anticipated to result in significant impacts to intersection LOS

- Given the planned installation of far-side bus stops and signal "priority" measures on Folsom Street (described on Page 6 of this memorandum), implementation of the proposed "four-to-three" lane conversion on Folsom Street could be carried out without significantly increasing transit travel time on the Folsom Street corridor. Key factors that that could serve to further reduce effects on travel time for buses are as follows:

    - Since intersection delay is largely limited to the queues that form when vehicles must stop for a "red" traffic signal, effective pre-emption measures could reduce

[1] *Conceptual Analysis of Transportation Impacts of Mission Streetscape Plan Improvements*, Memorandum from Jeremy Nelson and Francesca Napolitan, Nelson\Nygaard Consulting Associates, to Adam Varat and Ilaria Salvadori, City of San Francisco, June 19, 2009.

potential delays to transit resulting from increased queue lengths[2]. By extending the "green" signal cycle when buses approach, queues should be effectively dispersed prior to the arrival of each bus (assuming that buses would often arrive at the end of the cycle, which may be the case if buses are frequently triggering the signal over-ride to extend the cycle).

- With "priority" measures, a portion of buses would benefit from extended green time, but a portion of buses would be required to stop at red lights, thus leading to increased transit delay due to longer queues at signalized intersections. A quantifiable analysis of transit delay is not possible using the TRAFFIX methodology; therefore, a VISSIM analysis is recommended to quantify transit delay if signal "priority" measures are used.

- The effective installation of signal pre-emption measures (not just signal "priority" measures) to extend the "green" signal cycle when all buses approach, could ensure that buses would rarely be required to stop for a red light along Folsom Street. Delays to transit could occur, however, if Transit Effectiveness Program (TEP) recommendations are limited to signal "priority" (but not full "pre-emption") measures to extend "green" time when buses approach.

- Provision of center left-turn lanes (as proposed with the "four-to-three" lane conversion) should further ensure that queues are cleared when buses approach. This would occur by eliminating the delay caused when vehicles attempt to make a left-turn within the travel lane (as required by the current configuration).

- Due to the high volume of east-west traffic on 16th Street (including east-west transit service), it is not likely to be feasible to allow for full signal pre-emption for buses at the Folsom Street/16th Street intersection. Therefore, the proposed "four-to-three" conversion would result in added delay to buses at that intersection.

- Since intersections on Folsom (south of 16th) would operate at LOS C or better (indicating average or slight delays) there would be little incentive for motorists to divert to parallel corridors such as Mission, South Van Ness or Bryant Streets, since each of those corridors include intersections operating with greater delay based on existing volumes.

Folsom Street (north of 17th Street):

- At the Folsom Street/16th Street intersection, excessive queue lengths and increased transit delay would result if just one through lane is provided for northbound & southbound traffic on Folsom Street at that intersection.

- Additional measures are recommended, such as maintaining two through lanes, or installing queue-jump lanes for buses. Alternatively, installation of a "3+1" roadway configuration (with a parking "tow-away" zone in the peak direction of travel) could be considered for the segment of Folsom Street between 15th and 17th Streets.

[2] See page 19 for discussion of the increased transit travel time on the Folsom Street corridor that would result if signal priority measures were not to be provided.

- Further technical analysis is recommended if potential changes are considered north of 15th Street.

Alternative 2: South Van Ness Avenue

The analysis of Alternative 2 is provided on pages 24-27 of this memorandum. Key findings are as follows:

- Implementation of the proposed "four-to-three" conversion on South Van Ness Avenue (between 15th and 26th Streets) would likely result in significant impacts to LOS at key intersections on South Van Ness Avenue.

- Increased delay on South Van Ness Avenue would likely divert a portion of traffic to Folsom Street (given excess capacity on that corridor), which could impact transit operating speeds.

- There is less likelihood of traffic diverting to Mission Street, given existing delays (including LOS E operations at Misison/16th) and slower travel speeds on the corridor.

- Impacts could be potentially mitigated by providing a "3+1" lane configuration on South Van Ness Avenue:

    - A second through lane would be provided in the peak direction (northbound in the AM, and southbound in the PM). The "3+1" configuration could be accommodated by installing curb-side parking lanes that could convert to travel lanes during the peak travel periods.

    - With this configuration, intersection LOS under future-year conditions would represent an improvement over future baseline ("without project") conditions, due to the provision of a center left-turn lane and removal of on-street parking. Therefore, this alternative is not anticipated to result in diversion of traffic to parallel corridors.

    - Potential impacts to pedestrians (resulting from removal of the buffer provided by parked vehicles) would be limited to the peak periods (typically 7-9 AM northbound, and 3-7 PM southbound) and could be mitigated by providing wider sidewalks, pedestrian bulbouts and/or median refuges.

    - Traffic diversion would be limited to the off-peak direction (southbound in the AM, and northbound in the PM). Such trips would likely be diverted to Folsom Street. Given excess capacity on that corridor, especially in the off-peak direction, impacts are anticipated to be less than significant.

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Alternative 3: Bryant Street + Folsom Street

The analysis of Alternative 3 is provided on pages 28-30 of this memorandum. Key findings are as follows:

Bryant Street (23rd to 26th Street):

- The proposed "four-to-three" lane conversion on the three-block segment of Bryant Street is not expected to significantly impact traffic operations or result in significant increases in transit operating time.

- Operations on this segment, following a potential conversion to three lanes, would be superior to existing two-lane segment of Bryant Street (north of 23rd Street).

- Diversion of traffic to adjacent corridors is not anticipated, since the existing two-lane segment of Bryant Street already serves to effectively limit capacity on the corridor.

Folsom Street (15th to 26th)

- Findings do not differ from the Alternative 1 analysis (summarized above and described in greater detail on pages 18-24).

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PURPOSE AND OVERVIEW OF ANALYSIS

The following information is provided in this memorandum:

- Existing AM and PM peak hour LOS at eight study intersections, based on turning movement counts conducted on April 30, 2009 (see pages 10-12)

- Future Year AM and PM peak hour LOS at each of the eight study intersections, based on a growth forecast derived by Fehr & Peers from the *Eastern Neighborhoods EIR* for Year 2025 (see pages 13-17)

- "With Project" LOS analysis of three potential "four-to-three" lane conversion conversions within the MSP area:

  - *Alternative 1*: Folsom Boulevard would be converted from the current configuration (two through lanes in each direction) to a proposed three-lane configuration (one through lane in each direction with a two-way center left-turn lane) between 15th and 26th Streets.

  - *Alternative 2*: South Van Ness Avenue would be converted from the current configuration (two through lanes in each direction) to a proposed three-lane configuration (one through lane in each direction with a two-way center left-turn lane) between 15th and 26th Streets.

  - *Alternative 3*: Folsom Boulevard would be converted to a three-lane configuration between 15th and 26th Street (as proposed in Alternative 1), and the southern segment of Bryant Street (between 23rd and 26th Streets) would also be converted from the current configuration (two through lanes in each direction) to a proposed three-lane configuration (one through lane in each direction with a two-way center left-turn lane).

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BACKGROUND

As part of the MSP, the City of San Francisco Planning Department is evaluating a number of streetscape amenities and traffic calming improvements, including potential lane reduction(s) on one of the north-south corridors (such as Bryant, Folsom, Mission or South Van Ness). Nelson\Nygaard's conceptual analysis provided the following information:

- Assessment of the feasibility of potential MSP improvements, focusing on identifying potential transit and auto traffic impacts and design or operational mitigations
- Overview of daily traffic volumes and peak hour turning movements at key intersections on each of the corridors
- Review of applicable traffic operations guidelines and street design standards
- Conceptual evaluation of the potential feasibility of reducing number of traffic lanes on Folsom and/or Bryant Streets [3]
- Discussion of potential mitigation measures (if necessary) to minimize the diversion of vehicles to surrounding streets

TRANSIT ASSUMPTIONS FOR FUTURE-YEAR ANALYSIS

The City of San Francisco's Transit Effectiveness Program (TEP) has identified transit enhancement measures that will be implemented on key corridors to increase transit operating speeds and frequency of service. Mission and Folsom Streets have both been identified in the TEP. Based on input from MTA staff, the following TEP measures will likely be installed on Mission and Folsom Street (with or without the proposed Alternatives 1, 2 or 3):

A. Bus stops would be located at the far-side of intersections, and signal priority[4] devices would be installed on buses, allowing the "green" signal phase for north-south movements to be extended when buses approach. These two measures would allow most buses to reach the nearest "far-side" bus stop without being stopped at an upstream traffic signal.

B. Curb extensions would be installed at bus stop locations(also known as "bus bulbs"), thus allowing buses to stop within a travel lane, allowing for shorter stop time and quicker re-entry into traffic following each stop. However, MTA staff noted that current City policy would not allow for the installation of "bus bulbs" if Folsom were to be reduced to one through lane in each direction (as proposed with Alternatives 1 and 3).

[3] Conceptual evaluation of lane reduction(s) on South Van Ness Avenue may be performed later, pending the outcome of this level-of-service analysis, review of travel speed and collision data, and community input at upcoming workshops.

[4] The qualitative analysis of potential impacts to transit delay provided in this memorandum assumes that "transit priority" signal override measures would be installed to extend the "green" signal phase for a portion of northbound and southbound buses on Folsom Street (except at 16th Street). The transit assessment assumes that just a portion of buses would trigger the "priority" signal over-ride, consistent with the use of such measures elsewhere in San Francisco.

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STUDY INTERSECTIONS

The LOS analysis was performed at the following eight study intersections selected by the City of San Francisco and Nelson\Nygaard:

1. Bryant Street / 16th Street
2. Bryant Street / 24th Street
3. Folsom Street / 16th Street
4. Folsom Street / 24th Street
5. South Van Ness Avenue / 16th Street
6. South Van Ness Avenue / 24th Street
7. Mission Street / 16th Street
8. Mission Street / 24th Street

LOS Evaluation Criteria

Motor vehicle operations at intersections are typically described in terms of "level of service" (LOS). LOS is a qualitative measure of the effect of several factors on traffic operating conditions including speed, travel time, traffic interruptions, freedom to maneuver, safety, driving comfort, and convenience. Transportation planners and engineers generally measure LOS quantitatively in terms of vehicular delay and describe LOS using a scale that ranges from LOS A, the best operating conditions, to LOS F, the worst operating conditions. LOS E represents "at-capacity" operations. When traffic volumes exceed capacity, stop-and-go conditions result, and operations are designated as LOS F.

Fehr & Peers conducted the analysis of the study intersections (all signalized) using a method documented by the Transportation Research Board (TRB) in the 2000 Highway Capacity Manual (HCM). For signalized intersections, LOS is based on "control delay." Transportation engineers and planners define control delay as the delay directly associated with the traffic control device (i.e., a stop sign or a traffic signal) and specifically include initial deceleration delay, queue move-up time, stopped delay, and final acceleration delay. These delay estimates are considered meaningful indicators of driver discomfort and frustration, fuel consumption, and lost travel time. Table 1 presents the relationship between LOS and control delay for signalized intersections.

The LOS analysis performed for this analysis was conducted using TRAFFIX software, consistent with the preferred methodology for most transportation impact studies in San Francisco that are prepared under the direction of the San Francisco Planning Department's Major Environmental Analysis (MEA) division. This analysis incorporated the following adjustments to the software to account for the unique operating characteristics of the affected corridors:

- Mission Street: vehicle compression rates were adjusted to account for reduced travel speeds, narrow lane widths, double-parking and frequency of stopped buses. These adjustments were consistent with the *Eastern Neighborhoods EIR* analysis at the Mission/16th and Mission/24th intersections.

- South Van Ness, Folsom and Bryant Street: analysis accounts for narrow lane widths and frequency of stopped buses. At the South Van Ness/16th intersection, inclusion of these variables differs from the *Eastern Neighborhoods EIR*, which used default values without adjustment for the LOS analysis. (The remaining study intersections were not evaluated in the Eastern Neighborhoods EIR).

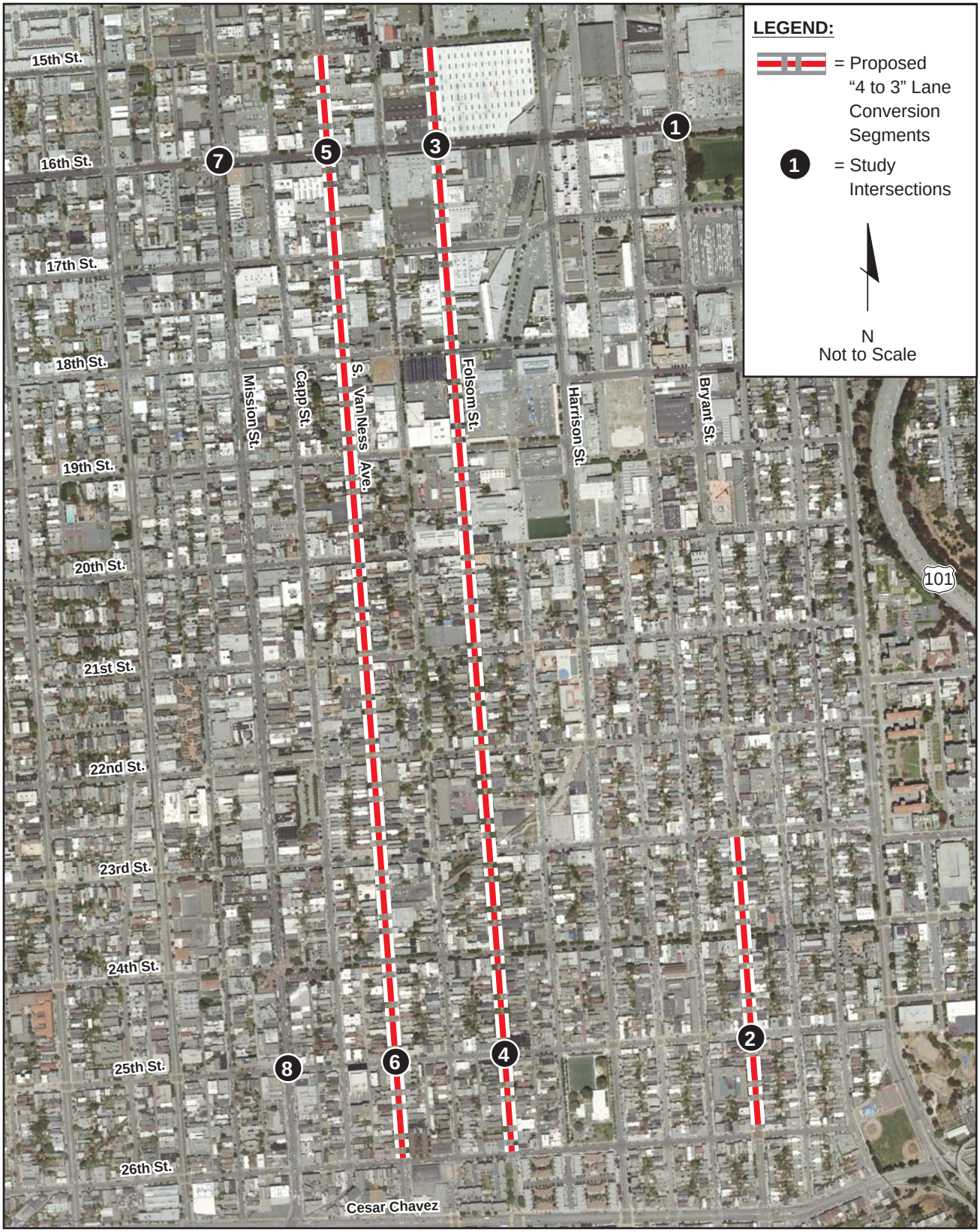
- Peak hour factor (PHF) of 0.90 was used for existing and future-year conditions. Future-year LOS analyses typically use a PHF of 0.98-1.00 (to account for greater "spreading" of peak hour volumes as future traffic growth occurs. In this case, the 0.90 PHF was used the future-year analysis for consistency purposes, and to provide a more conservative assessment.

Based on City of San Francisco policy significant impacts to intersection LOS could occur if rnatives 1, 2 or 3 were to cause an intersection to degrade from LOS D or better to LOS E or F.

TAB
SIGNALIZED INTERSECTION LOS CRITERIA

LOS	Average Control Delay (seconds/vehicle)	Description
A	< 10.0	Operations with very slight delay, with no approach phase fully utilized.
B	10.1 – 20.0	Operations with slight delay and an occasional approach phase are fully utilized.
C	20.1 - 35.0	Operations with average delay. Individual cycle failures begin to appear.
D	35.1 – 55.0	Operations with tolerable delay. Many vehicles stop and individual cycle failures are noticeable.
E	55.1 - 80.0	Operations with high delay, up to several signal cycles. Long queues form upstream of intersection.
F	> 80.0	Operation with excessive and unacceptable delays. Volumes vary widely depending on downstream queue conditions.

Source: Transportation Research Board, *Highway Capacity Manual*, Special Report 209, 2000.



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Mission Streetscape

PROPOSED "4 TO 3" CONVERSION CORRIDORS AND STUDY INTERSECTIONS

July 2009
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FIGURE 1

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BASELINE LEVEL OF SERVICE ANALYSIS – EXISTING LANE CONFIGURATIONS

The "baseline" analysis is based on the current (year 2009) lane configurations at each study intersection.

Existing (Year 2009) Traffic Volumes

Existing AM and PM peak hour LOS[5] was analyzed based on turning movement counts conducted at each study intersection on April 30, 2009. The results are summarized in Table 2.

Key findings are that:

- Bryant Street intersections operate at LOS C or better, indicating acceptable operations with average delays.
- Folsom Street intersections operate at LOS B or better, indicating acceptable operations with slight delays.
- South Van Ness Avenue/16th Street operates at LOS D during the AM peak hour, indicating acceptable operations with tolerable delays, and LOS C during the PM peak hour; while South Van Ness Avenue/24th Street operates at LOS B during both peak hours.
- Mission Street/16th Street operates at LOS E during the AM peak hour, indicating unacceptable operations with high delay. Lengthy queues form on the one-lane eastbound 16th Street approach, while frequent bus blockages and vehicle drop-offs serve to constrain operations. Operations at this intersection improve to LOS D during the PM peak hour, mainly due to reduce queue lengths on the eastbound 16th Street approach (compared to the AM peak hour).
- Mission Street/24th Street operates at LOS C during the AM peak hour and LOS D during the PM peak hour.

[5] LOS based on stand-alone analysis of each intersection using TRAFFIX software. This methodology does not account for the metering effects of delay at upstream intersections, which can improve operations at downstream locations.

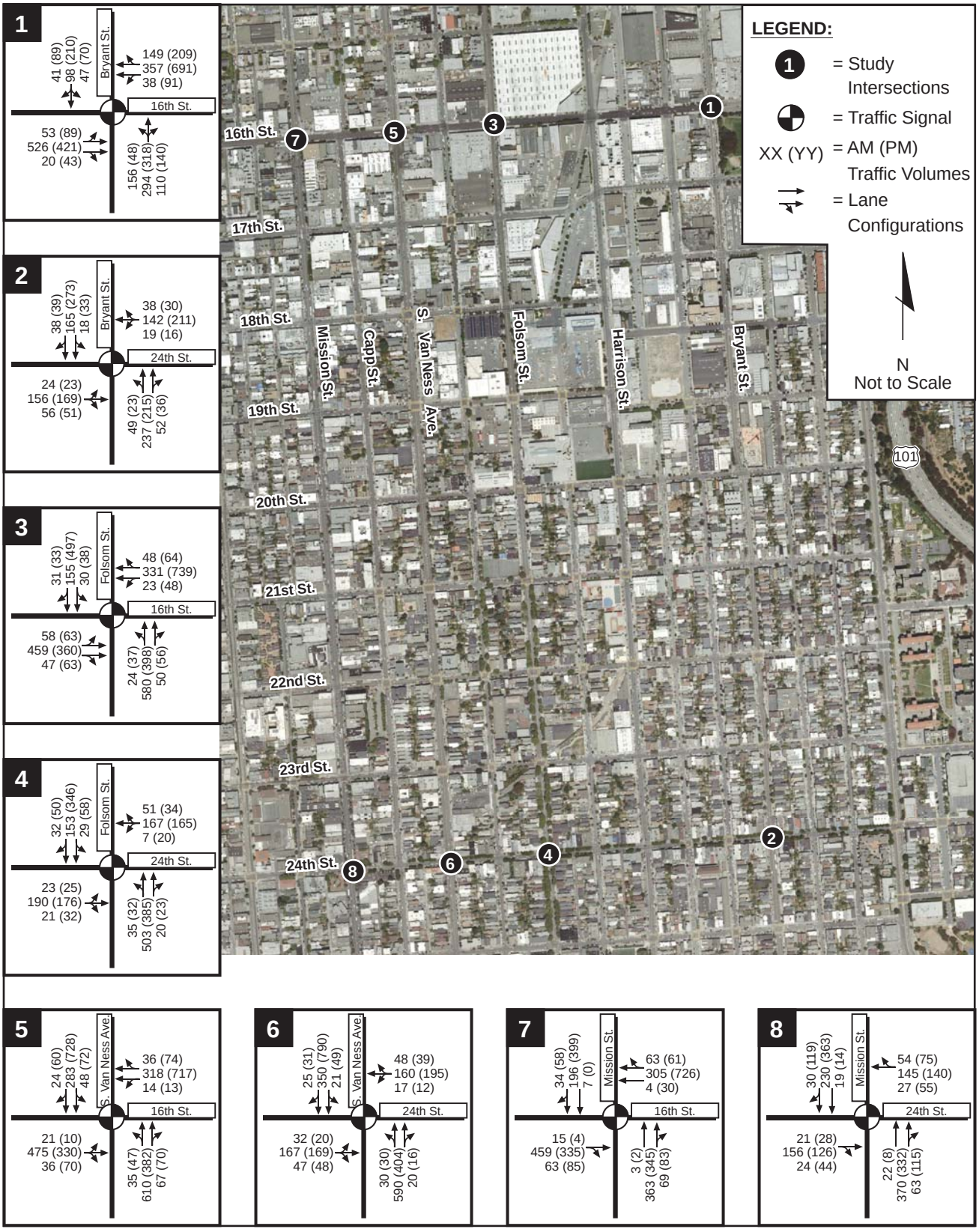
TABLE 2
EXISTING CONDITIONS
LEVEL OF SERVICE & NORTH/SOUTH QUEUE COMPARISION

Intersection	Intersection LOS				Peak North-South Through Movement[1]	
	AM Peak Hour		PM Peak Hour		Queue Length (Number of Vehicles per Lane)[2]	
	LOS	Average Delay (seconds)	LOS	Average Delay (seconds)	AM Peak Hour	PM Peak Hour
1. Bryant Street / 16th Street	C	21.8	B	18.9	15 veh.	7 veh.
2. Bryant Street / 24th Street	B	13.6	B	13.7	2 veh.	2 veh.
3. Folsom Street / 16th Street	B	12.0	B	13.9	5 veh.	4 veh.
4. Folsom Street / 24th Street	B	12.9	B	12.3	3 veh.	3 veh.
5. S. Van Ness Avenue /16th Street	D	36.2	C	21.5	6 veh.	10 veh.
6. S. Van Ness Avenue / 24th Street	B	14.6	B	14.6	4 veh.	6 veh.
7. Mission Street / 16th Street	E	68.5	D	39.2	4 veh.	5 veh.
8. Mission Street/ 24th Street	C	26.8	D	42.4	4 veh.	4 veh.

Notes: [1] Peak direction north-south movement is northbound during the AM peak hour, and southbound during the PM peak hour.

[2] Theoretical queue length based on TRAFFIX analysis software of stand-alone intersection. Actual queue length will differ due to upstream metering effect (at adjacent signalized and stop-controlled intersections) and other site-specific factors. As provided here, the queue length values are intended to provide an "order-of-magnitude" comparison of existing queues and the impact of potential lane reductions.

Source: Fehr & Peers, 2009



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Mission Streetscape

EXISTING PEAK HOUR VOLUMES AND LANE CONFIGURATIONS

July 2009
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FIGURE 2

Future (Year 2025) Traffic Volumes

Future LOS was evaluated for the AM and PM peak hour. The "Baseline" analysis assumes the current lane configurations will be retained at each study intersection. The LOS results are summarized in Table 3.

Growth Forecast Methodology

Future (Year 2025) traffic volume forecasts were derived from growth forecasts contained in the *Eastern Neighborhoods EIR.* Although the City provided the TRAFFIX files from the Eastern Neighborhoods EIR analysis to Fehr & Peers, it was not possible to derive the "paths" used to predict future growth on specific corridors. Therefore, Fehr & Peers derived a growth forecast using the following methodology:

- Forecasts of PM peak hour traffic growth at the South Van Ness/16th, Mission/16th and Mission/24th intersections were derived from the "net change" in traffic volumes between 2005 and 2025 (as forecasted by the Eastern Neighborhoods EIR)

- PM peak hour traffic growth at Folsom/16th and Bryant/16th was directly derived from the South Van Ness/16th growth forecast. This methodology assumed an identical increase in trips at all three intersections, with turning movements distributed based on existing volumes.

- PM peak hour traffic growth at South Van Ness/24th, Folsom/24th and Bryant/24th was directly derived from the Mission/24th growth forecast. This methodology assumed an identical increase in trips at all three intersections, with turning movements distributed based on existing volumes.

- Since the *Eastern Neighborhoods EIR* did not contain an AM peak hour analysis, the AM peak hour traffic growth forecasts for this memorandum were derived from the PM peak hour growth forecast:

    - Number of trips was pro-rated downward (from the PM peak hour forecast), to account for lower volumes during the AM peak hour

    - Direction of forecasted trips was reversed (i.e., eastbound AM growth forecast was derived from westbound PM growth forecast; northbound AM growth forecast was derived from southbound PM forecast, etc.)

Future-Year LOS Findings

The potential increase in trips at each intersection was determined for each turning movement, and then added to the existing volumes. Based on this methodology:

- Bryant Street/16th Street LOS would decline from C to E[6] (indicating unacceptable operations), during the PM peak hour. This occurs due to increased northbound volumes on Bryant Street, and eastbound volumes on 16th Street. During the AM peak hour, operations decline from LOS B to C.

- Bryant Street/24th Street would operate at LOS B during the AM peak hour and LOS C during the PM peak hour, indicating acceptable operations with average or slight delay.

- Folsom Street intersections at 16th and 24th Streets would continue to operate at LOS B or better, indicating acceptable operations with slight delays.

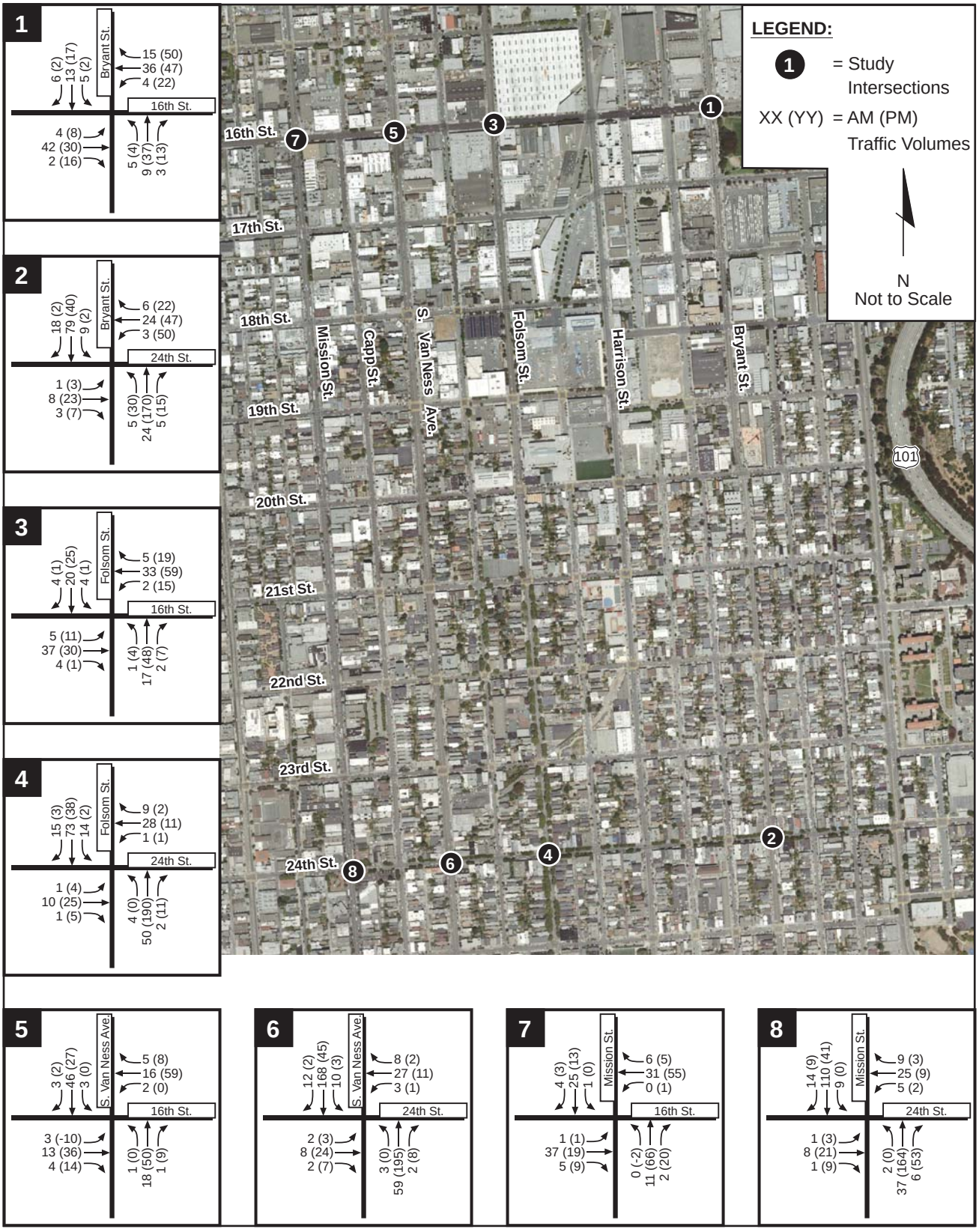
- South Van Ness Avenue/16th Street would continue to operate at LOS D during the AM peak hour, indicating acceptable operations with tolerable delays, and LOS C during the PM peak hour.

- South Van Ness Avenue/24th Street would continue to operate at LOS B during both peak hours.

- Mission Street/16th Street would continue to operate unacceptably during the AM peak hour, with LOS declining from E to F. During the PM peak hour, this intersection would continue to operate at LOS D.

- Mission Street/24th Street would degrade from LOS C to D during the AM peak hour, and the intersection would continue to operate at LOS D during the PM peak hour.

[6] A more refined future-year growth forecast would likely yield an improvement in LOS. The methodology used for this analysis based Bryant/16th traffic growth on the forecasted growth at South Van Ness/16th, which will likely be higher than what materializes at Bryant/16th.



Mission Streetscape

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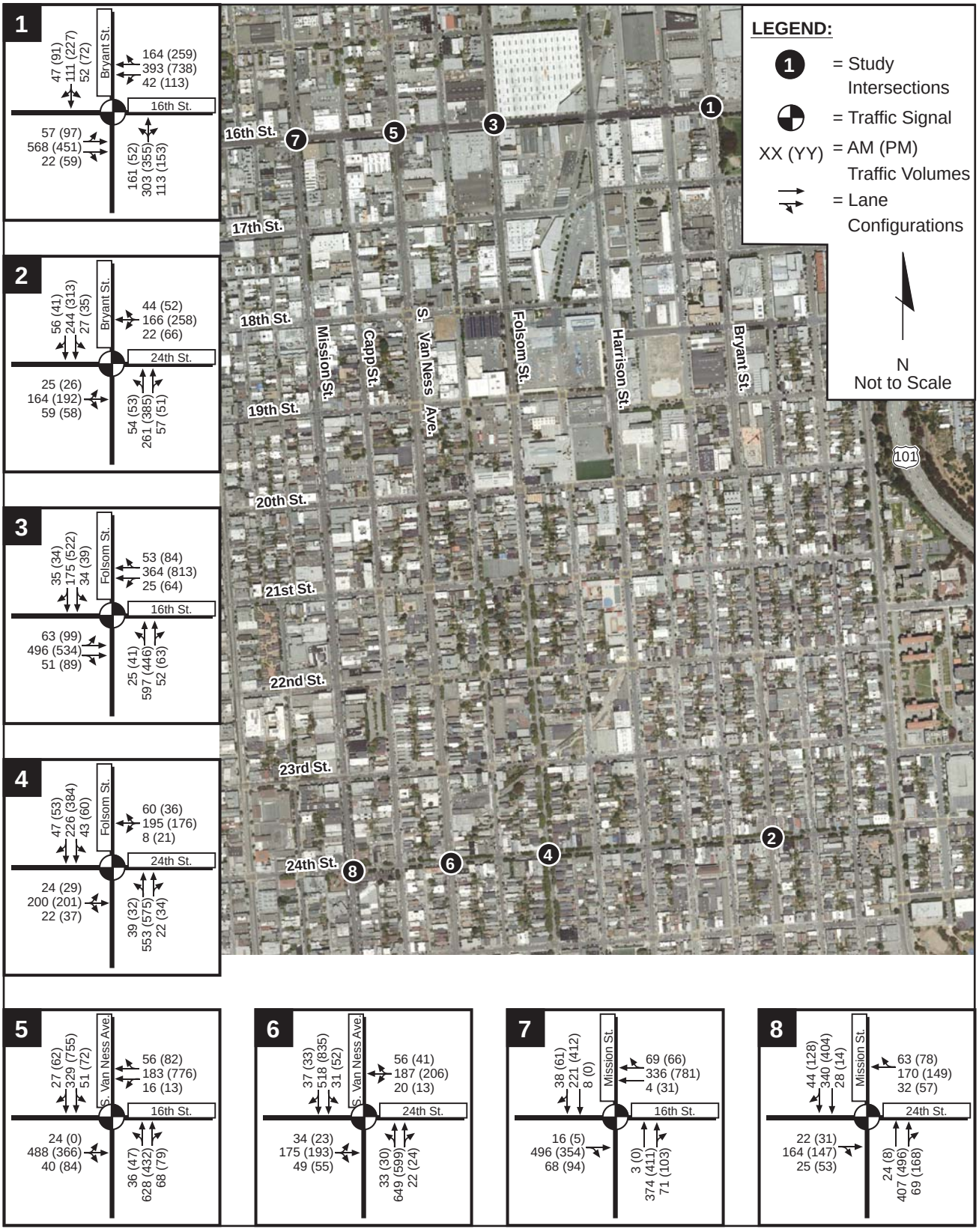
YEAR 2025 TRAFFIC GROWTH FORECAST*

July 2009
SF09-0447\graphics\0447-3 forecast_2025

*Derived by Fehr & Peers from EN EIR PM peak hour forecast for Mission/16th, Mission/24th, and S. Van Ness/16th.

FIGURE 3



Mission Streetscape

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YEAR 2025 PEAK HOUR VOLUMES AND LANE CONFIGURATIONS

July 2009
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FIGURE 4

TABLE 3
FUTURE VOLUMES
LEVEL OF SERVICE & NORTH/SOUTH QUEUE COMPARISION
CURRENT LANE CONFIGURATIONS

Intersection	Intersection LOS				Peak North-South Through Movement[1]	
	AM Peak Hour		PM Peak Hour		Queue Length (Number of Vehicles per Lane)[2]	
	LOS	Average Delay (seconds)	LOS	Average Delay (seconds)	AM Peak Hour	PM Peak Hour
1. Bryant Street / 16th Street	C	24.8	E	63.3	18 veh.	8 veh.
2. Bryant Street / 24th Street	B	13.8	C	27.8	2 veh.	2 veh.
3. Folsom Street / 16th Street	B	12.3	B	16.2	5 veh.	4 veh.
4. Folsom Street / 24th Street	B	13.4	B	12.9	4 veh.	3 veh.
5. S. Van Ness Avenue /16th Street	D	40.7	C	25.5	6 veh.	11 veh.
6. S. Van Ness Avenue / 24th Street	B	15.9	B	16.1	5 veh.	7 veh.
7. Mission Street / 16th Street	F	>80	D	53.0	4 veh.[3]	5 veh.
8. Mission Street/ 24th Street	D	36.8	D	50.5	4 veh.	4 veh.

Notes:

[1] Peak direction north-south movement is northbound during the AM peak hour and southbound during the PM peak hour.

[2] Theoretical queue length based on TRAFFIX analysis software of stand-alone intersection. Actual queue length will differ due to upstream metering effect (at adjacent signalized and stop-controlled intersections) and other site-specific factors. As provided here, the queue length values are intended to provide an "order-of-magnitude" comparison of existing queues and the impact of potential lane reductions.

[3] Reflects PM peak hour southbound movement on Mission Street. Eastbound approach on 16th Street would experience the longest delay and queue length.

Source: Fehr & Peers, 2009

ALTERNATIVE 1 (FOLSOM STREET)

Under this alternative, Folsom Street would be converted from its current configuration (two through lanes in each direction) to a three-lane configuration (one through lane in each direction with a two-way center left-turn lane). This analysis assumes the conversion would extend between 15th and 25th Streets.

In order to provide a "worst-case" analysis for conditions on Folsom Street, the analysis below does not assume that reducing the number of travel lanes would result in a diversion of traffic to adjacent corridor.

Level of Service & Bus Delay Analysis

Alternative 1 with Existing Traffic Volumes

AM and PM peak hour LOS with the proposed "4 to 3" conversion was analyzed based on turning movement counts conducted at each study intersection on April 30, 2009. The results are summarized in Table 4. Key findings, based on existing volumes, are that:

- Impacts to intersection LOS at Folsom Street/16th Street (based on existing volumes) would be less than significant during both peak hours:
    - During the AM peak hour, LOS would degrade from LOS B to C (indicating acceptable operations with average delays). However, the length of the northbound queue would increase from five vehicles per lane (based on existing lane configurations) to 13 vehicles (due to the reduction in travel lanes). Average delays would increase by 14 seconds per vehicle for the northbound approach, and one second per vehicle for the southbound approach.
    - During the PM peak hour, LOS would remain at LOS B, and the length of the peak direction (southbound) queue would increase from four to seven vehicles per lane (due to the lane reduction). Average delays would increase by five seconds per vehicle for the northbound approach, and seven seconds per vehicle for the southbound approach.
- Impacts to intersection LOS at Folsom Street/24th Street (based on existing volumes) would be less than significant both peak hours:
    - During both peak hours, LOS would remain at LOS B.
    - Peak queue lengths would increase from three to eight vehicles (northbound) during the AM peak hour, and from three to five vehicles (southbound) during the PM peak hour
    - Average delays would for the northbound approach would increase by four seconds during the AM peak hour, and two seconds during the PM peak hour
    - Average delays would for the southbound approach would increase by less than one second during the AM peak hour, and two seconds during the PM peak hour

- Delays to transit could occur, due to the effect of increased queue length on bus travel time. Based on current transit operating characteristics:

    - At most intersections on the study corridor (between 15th and 26th), the increased delay is likely to be less than that predicted for Folsom/24th as 24th Street has the highest volume (excluding 16th Street) among cross streets. Based on that assumption, average northbound delay (excluding the Folsom/16th intersection) would increase by four seconds per intersection during the AM peak hour, and two seconds per intersection during the PM peak hour.

    - Based on these assumptions, total northbound delay between 15th and 26th (including the 16th Street intersection) would increase by up to 50 seconds during the AM peak hour, and by up to 23 seconds during the PM peak hour.

    - Total southbound delay between 15th and 25th (including the 16th Street intersection) would increase by less than 10 seconds during the AM peak hour, and by up to 25 seconds during the PM peak hour.

    - Actual increases in delay to transit compared to existing conditions will be reduced from the amounts shown here, since TEP measures will extend the "green" time for a portion of buses traveling on Folsom Street. .

- Based on these findings:

    - Some diversion of traffic to South Van Ness Avenue could occur. However, such diversion should be limited, particularly due to existing delays at the South Van Ness/16th intersection.

    - Transit enhancement measures envisioned by the TEP could reduce the likelihood of traffic diversion from Folsom, since motorists could also benefit from traffic signal enhancements such as extended green time.

    - To the extent some traffic would divert from Folsom to South Van Ness, the minor transit travel time increases described above would be even less than described.

Alternative 1 with Future Traffic Volumes

AM and PM peak hour LOS was analyzed based on the future (year 2025) growth forecast derived by Fehr & Peers. The results are summarized in Table 5.

- Results do not substantially change from those found with existing volumes. Folsom/16th and Folsom/24th would continue to operate at LOS B during both peak hours, and peak queue lengths would increase.

- Delays to transit could occur, due to the effect of increased queue length on bus travel time. However, the installation of TEP signal "priority" measures would allow many, if not most, buses to pass through intersections unimpeded by increased queues. The benefits of such measures could be evaluated more precisely using a micro-simulation tool, such as VISSIM software, to evaluate the potential effect on transit travel time.

- Significant diversion of traffic to adjacent corridors is not anticipated. Given increased delay on Mission, South Van Ness and Bryant, resulting from future traffic growth, the likelihood of future traffic diversion is further reduced (compared to the probability of diversion based on existing volumes).

TABLE 4
ALTERNATIVE 1 -- EXISTING VOLUMES
LEVEL OF SERVICE & NORTH/SOUTH QUEUE COMPARISION
FOLSOM FOUR-TO-THREE CONVERSION

Intersection	Intersection LOS				Peak North-South Through Movement[1]	
	AM Peak Hour		PM Peak Hour		Queue Length (Number of Vehicles per Lane)[2]	
	LOS	Average Delay (seconds)	LOS	Average Delay (seconds)	AM Peak Hour	PM Peak Hour
1. Bryant Street / 16th Street	C	21.8	B	18.9	15 veh.	7 veh.
2. Bryant Street / 24th Street	B	13.6	B	13.7	2 veh.	2 veh.
3. Folsom Street / 16th Street	B	17.1	B	18.9	13 veh.	7 veh.
4. Folsom Street / 24th Street	B	14.0	B	14.1	8 veh.	5 veh.
5. S. Van Ness Avenue /16th Street	D	36.2	C	21.5	6 veh.	10 veh.
6. S. Van Ness Avenue / 24th Street	B	14.6	B	14.6	4 veh.	6 veh.
7. Mission Street / 16th Street	E	68.5	D	39.2	4 veh.	5 veh.
8. Mission Street/ 24th Street	C	26.8	D	42.4	4 veh.	4 veh.

Notes: [1] Peak direction north-south movement is northbound during the AM peak hour, and southbound during the PM peak hour.

[2] Theoretical queue length based on TRAFFIX analysis software of stand-alone intersection. Actual queue length will differ due to upstream metering effect (at adjacent signalized and stop-controlled intersections) and other site-specific factors. As provided here, the queue length values are intended to provide an "order-of-magnitude" comparison of existing queues and the impact of potential lane reductions.

Source: Fehr & Peers, 2009

TABLE 5
FUTURE VOLUMES –ALTERNATIVE 1
LEVEL OF SERVICE & NORTH/SOUTH QUEUE COMPARISION
FOLSOM FOUR-TO-THREE CONVERSION

Intersection	Intersection LOS				Peak North-South Through Movement[1] Queue Length (Number of Vehicles per Lane)[2]	
	AM Peak Hour		PM Peak Hour			
	LOS	Average Delay (seconds)	LOS	Average Delay (seconds)	AM Peak Hour	PM Peak Hour
1. Bryant Street / 16th Street	C	24.8	E	63.3	18 veh.	8 veh.
2. Bryant Street / 24th Street	B	13.8	C	27.8	2 veh.	2 veh.
3. Folsom Street / 16th Street	B	17.9	B	19.0	14 veh.	11 veh.
4. Folsom Street / 24th Street	B	15.1	B	15.3	9 veh.	5 veh.
5. S. Van Ness Avenue /16th Street	D	40.7	C	25.5	6 veh.	11 veh.
6. S. Van Ness Avenue / 24th Street	B	15.9	B	16.1	5 veh.	7 veh.
7. Mission Street / 16th Street	F	>80	D	53.0	4 veh.[3]	5 veh.
8. Mission Street/ 24th Street	D	36.8	D	50.5	4 veh.	4 veh.

Notes:

[1] Peak direction north-south movement is northbound during the AM peak hour and southbound during the PM peak hour.

[2] Theoretical queue length based on TRAFFIX analysis software of stand-alone intersection. Actual queue length will differ due to upstream metering effect (at adjacent signalized and stop-controlled intersections) and other site-specific factors. As provided here, the queue length values are intended to provide an "order-of-magnitude" comparison of existing queues and the impact of potential lane reductions.

[3] Reflects PM peak hour southbound movement on Mission Street. Eastbound approach on 16th Street would experience the longest delay and queue length.

Source: Fehr & Peers, 2009

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Potential Transit Strategy

Given the planned installation of far-side bus stops and signal "priority" measures on Folsom Street (described on Page 6 of this memorandum), implementation of the proposed "four-to-three" lane conversion on Folsom Street could be carried out without significantly increasing transit travel time on the Folsom Street corridor. Key factors that that could serve to further reduce effects on travel time for buses are as follows:

- The effective installation of signal pre-emption measures (not just signal "priority" measures) to extend the "green" signal cycle when all buses approach, could ensure that buses would rarely be required to stop for a red light along Folsom Street.

- Since intersection delay is largely limited to the queues that form when vehicles must stop for a "red" traffic signal, effective pre-emption measures could reduce potential delays to transit resulting from increased queue lengths. By extending the "green" signal cycle when buses approach, queues should be effectively dispersed prior to the arrival of each bus (assuming that buses would often arrive at the end of the cycle, which may be the case if buses are frequently triggering the signal over-ride to extend the cycle).

- Provision of center left-turn lanes (as proposed with the "four-to-three" lane conversion) should further ensure that queues cleared when buses approach. This would occur by eliminating the delay caused when vehicles attempt to make a left-turn within the travel lane (as required by the current configuration).

- Due to the high volume of east-west traffic on 16th Street (including east-west transit service), it is not likely to be feasible to allow for full signal pre-emption for buses at the Folsom Street/16th Street intersection. Therefore, the proposed "four-to-three" conversion would result in added delay to buses at that intersection.

Therefore, based on the transit assumptions described above:

- The proposed "four-to-three" lane conversion on Folsom Street is not anticipated to result in significant impacts at intersections south of 16th Street. Given the likelihood of impacts at Folsom Street/16th Street, it may be advisable to adjust the boundaries of the proposed "4 to 3" conversion to extend from 17th to 26th (thus excluding 16th Street). Alternatively, mitigation measures could be investigated to reduce potential the likelihood of potential transit delay at Folsom/16th.

- To avoid potential delays to transit at the Folsom Street/16th Street intersection, it is advisable to consider measures to red potential transit delay due to increased queues at that intersection. Such measures could include:

    - Installation of queue-jump lanes, to allow northbound and southbound buses to bypass the extended queue that would result if just one through lane is provided at this intersection; and/or

    - Maintaining two through lanes at this intersection, by limiting the "four-to-three" conversion to the segment of Folsom Street between 17th and 26th Streets; or

- Providing a second through lane during peak periods only, by installing parking "tow-away" lanes that could be converted to travel lanes. Provision of a second through lane could be limited to the traditional peak direction of travel (northbound in the AM, and southbound in the PM).

ALTERNATIVE 2 (SOUTH VAN NESS AVENUE)

Under this alternative, South Van Ness Avenue would be converted from its current configuration (two through lanes in each direction) to a three-lane configuration (one through lane in each direction with a two-way center left-turn lane). This analysis assumes the conversion would extend between 15th and 26th Streets. In order to provide a "worst-case" analysis for conditions on South Van Ness Avenue, the analysis below does not assume that reducing the number of travel lanes would result in a diversion of traffic to adjacent corridor.

Level of Service Analysis

Existing Traffic Volumes

AM and PM peak hour LOS was analyzed based on turning movement counts conducted at each study intersection on April 30, 2009. The results are summarized in Table 6.

Future Traffic Volumes

AM and PM peak hour LOS was analyzed based on the future (year 2025) forecast. The results are summarized in Table 7.

Findings

Key findings of the Alternative 2 analysis (with existing and future volumes) are that:

- Significant impacts to LOS would occur at the South Van Ness/16th and South Van Ness/24th intersections.
  - South Van Ness/16th would operate unacceptably, at LOS E during both peak hours, and peak-hour queue lengths would exceed 20 vehicles per lane
  - South Van Ness/24th would operate acceptably at LOS C during the AM peak hour, with a lengthy peak-direction queue of 13 vehicles (based on existing volumes) and 17 vehicles (based on future volumes). During the PM peak hour, operations would decline to LOS E (indicating unacceptable operations) with a peak-hour queue length exceeding 20 vehicles per lane
- Given excessive queue lengths, significant diversion of traffic would occur. Given excess capacity on Folsom Street, this would result in a substantial number of trips diverting to a primarily residential corridor.
- Direct impacts to transit are not anticipated, since South Van Ness Avenue is not a MTA transit corridor. However, diversion of traffic to adjacent corridors could affect transit operating speeds, particularly on Folsom Street.

TABLE 6
ALTERNATIVE 2 -- EXISTING VOLUMES
LEVEL OF SERVICE & NORTH/SOUTH QUEUE COMPARISION
SOUTH VAN NESS FOUR-TO-THREE CONVERSION

Intersection	Intersection LOS				Peak North-South Through Movement[1]	
	AM Peak Hour		PM Peak Hour		Queue Length (Number of Vehicles per Lane)[2]	
	LOS	Average Delay (seconds)	LOS	Average Delay (seconds)	AM Peak Hour	PM Peak Hour
1. Bryant Street / 16th Street	C	21.8	B	18.9	15 veh.	7 veh.
2. Bryant Street / 24th Street	B	13.6	B	13.7	2 veh.	2 veh.
3. Folsom Street / 16th Street	B	12.0	B	13.9	5 veh.	4 veh.
4. Folsom Street / 24th Street	B	12.9	B	12.3	3 veh.	3 veh.
5. S. Van Ness Avenue /16th Street	E	64.0	E	66.0	>20 veh.	>20 veh.
6. S. Van Ness Avenue / 24th Street	C	20.0	D	46.6	13 veh.	>20 veh.
7. Mission Street / 16th Street	E	68.5	D	39.2	4 veh.	5 veh.
8. Mission Street/ 24th Street	C	26.8	D	42.4	4 veh.	4 veh.

Notes:

[1] Peak direction north-south movement is northbound during the AM peak hour, and southbound during the PM peak hour.

[2] Theoretical queue length based on TRAFFIX analysis software of stand-alone intersection. Actual queue length will differ due to upstream metering effect (at adjacent signalized and stop-controlled intersections) and other site-specific factors. As provided here, the queue length values are intended to provide an "order-of-magnitude" comparison of existing queues and the impact of potential lane reductions.

[3] Assumes second southbound lane on South Van Ness Avenue at 16th Street during PM peak hour (due to use of parking lane).

Source: Fehr & Peers, 2009

TABLE 7A
ALTERNATIVE 2 WITH FUTURE (YEAR 2025) VOLUMES
INTERSECTION LEVEL OF SERVICE & PEAK DIRECTION QUEUE LENGTH

SOUTH VAN NESS FOUR-TO-THREE CONVERSION (UNMITIGATED)

Intersection	Intersection LOS				Peak North-South Through Movement[1] Queue Length (Number of Vehicles)	
	AM Peak Hour		PM Peak Hour			
	LOS	Average Delay (seconds)	LOS	Average Delay (seconds	AM	PM
1. Bryant Street / 16th Street	C	24.8	E	63.3	18 veh.	8 veh.
2. Bryant Street / 24th Street	B	13.8	C	27.8	2 veh.	2 veh.
3. Folsom Street / 16th Street	B	12.3	B	16.2	5 veh.	4 veh.
4. Folsom Street / 24th Street	B	13.4	B	12.9	4 veh.	3 veh.
5. S. Van Ness Avenue /16th Street	E	72.0	E	75.1	>20 veh.	>20 veh.
6. S. Van Ness Avenue / 24th Street	C	25.1	E	57.8	17 veh.	>20 veh.
7. Mission Street / 16th Street	F	>80	D	53.0	4 veh. [3]	5 veh.
8. Mission Street/ 24th Street	D	36.8	D	50.5	4 veh.	4 veh.

Notes: [1] Peak direction north-south movement is northbound during the AM peak hour and southbound during the PM peak hour.

Source: Fehr & Peers, 2009

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Mitigated Alternative 2 Analysis

Given the findings discussed above, Fehr & Peers evaluated a "mitigated Alternative 2" scenario, in which one additional travel lane would be provided in the peak direction (northbound in the AM, and southbound in the PM) by installing parking tow-away lanes that could be converted to travel lanes during peak periods. Table 7B shows the LOS findings with the Mitigated Alternative 2 ("3+1" lane configuration on South Van Ness).

As shown, both study intersections (South Van Ness/16th and South Van Ness/24th) would operate acceptably during both peak hours. Overall LOS would not differ substantially from "without project" conditions", since peak-direction capacity would increase slightly compared to the existing lane configuration (due to the provision of a center left-turn lane). Based on this analysis, the mitigated Alternative 2 ("3+1" conversion) could be implemented with less than significant impacts on intersection LOS and transit. Further study may be warranted to consider potential impacts on pedestrian circulation and/or parking.

TABLE 7B
ALTERNATIVE 2 WITH FUTURE (YEAR 2025) VOLUMES
INTERSECTION LEVEL OF SERVICE & PEAK DIRECTION QUEUE LENGTH

SOUTH VAN NESS FOUR-TO-THREE CONVERSION (MITIGATED "3+1")

Intersection	Intersection LOS				Peak North-South Through Movement[1] Queue Length (Number of Vehicles)	
	AM Peak Hour		PM Peak Hour			
	LOS	Average Delay (seconds)	LOS	Average Delay (seconds	AM	PM
1. Bryant Street / 16th Street	C	24.8	E	63.3	18 veh.	8 veh.
2. Bryant Street / 24th Street	B	13.8	C	27.8	2 veh.	2 veh.
3. Folsom Street / 16th Street	B	12.3	B	16.2	5 veh.	4 veh.
4. Folsom Street / 24th Street	B	13.4	B	12.9	4 veh.	3 veh.
5. S. Van Ness Avenue /16th Street	D	41.0	C	26.4	6 veh.	10 veh.
6. S. Van Ness Avenue / 24th Street	B	18.1	C	20.0	4 veh.	7 veh.
7. Mission Street / 16th Street	F	>80	D	53.0	4 veh.	5 veh.
8. Mission Street/ 24th Street	D	36.8	D	50.5	4 veh.	4 veh.

Notes: [1] Peak direction north-south movement is northbound during the AM peak hour and southbound during the PM peak hour.

Source: Fehr & Peers, 2009

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ALTERNATIVE 3: FOLSOM STREET + BRYANT STREET

Under this alternative, Folsom Street would be converted from "4 to 3" lanes (as called for by Alternative 1) and Bryant Street would be converted from "4 to 3" lanes (between 23rd and 26th Streets).

Level of Service Analysis

Existing Traffic Volumes

AM and PM peak hour LOS was analyzed based on turning movement counts conducted at each study intersection on April 30, 2009. The LOS results are summarized in Table 8.

Future Traffic Volumes

The LOS results, based on future (year 2025) traffic volumes, are summarized in Table 9.

Findings

Based on the existing and future-year analysis:

- Impact findings on Folsom Street would not differ from the findings of Alternative 1 (see pages 15-19)
- The Bryant/24th intersection would operate at LOS B during the AM peak hour, LOS B (existing volumes) or C (future volumes) during the PM peak hour. The minor increase in queue length and vehicle delay could be alleviated by removal of stop signs at one or more intersections
- Given the relatively short length of the Bryant study corridor, the relatively minor change in queue lengths, and the likelihood that increased delay could be mitigated with stop sign removal, operating speeds for transit service on Bryant Street are anticipated to be less than significant.
- Since Bryant Street is already limited to one lane in each direction (north of 23rd), diversion of traffic to adjacent corridors is not anticipated.

TABLE 8
ALTERNATIVE 3 -- EXISTING VOLUMES
LEVEL OF SERVICE & NORTH/SOUTH QUEUE COMPARISION
FOLSOM & BRYANT FOUR-TO-THREE CONVERSION

Intersection	Intersection LOS				Peak North-South Through Movement[1]	
	AM Peak Hour		PM Peak Hour		Queue Length (Number of Vehicles per Lane)[2]	
	LOS	Average Delay (seconds)	LOS	Average Delay (seconds)	AM Peak Hour	PM Peak Hour
1. Bryant Street / 16th Street	C	21.8	B	18.9	15 veh.	7 veh.
2. Bryant Street / 24th Street	B	14.0	B	13.4	3 veh.	3 veh.
3. Folsom Street / 16th Street	B	17.1	B	18.9	13 veh.	7 veh.
4. Folsom Street / 24th Street	B	14.0	B	14.1	8 veh.	5 veh.
5. S. Van Ness Avenue /16th Street	D	36.2	C	21.5	6 veh.	10 veh.
6. S. Van Ness Avenue / 24th Street	B	14.6	B	14.6	4 veh.	6 veh.
7. Mission Street / 16th Street	E	68.5	D	39.2	4 veh.	5 veh.
8. Mission Street/ 24th Street	C	26.8	D	42.4	4 veh.	4 veh.

Notes: [1] Peak direction north-south movement is northbound during the AM peak hour, and southbound during the PM peak hour.

[2] Theoretical queue length based on TRAFFIX analysis software of stand-alone intersection. Actual queue length will differ due to upstream metering effect (at adjacent signalized and stop-controlled intersections) and other site-specific factors. As provided here, the queue length values are intended to provide an "order-of-magnitude" comparison of existing queues and the impact of potential lane reductions.

Source: Fehr & Peers, 2009

TABLE 9
FUTURE VOLUMES –ALTERNATIVE 3
LEVEL OF SERVICE & NORTH/SOUTH QUEUE COMPARISION
FOLSOM & BRYANT FOUR-TO-THREE CONVERSION

Intersection	Intersection LOS				Peak North-South Through Movement[1]	
	AM Peak Hour		PM Peak Hour		Queue Length (Number of Vehicles per Lane) [2]	
	LOS	Average Delay (seconds)	LOS	Average Delay (seconds)	AM Peak Hour	PM Peak Hour
1. Bryant Street / 16th Street	C	24.8	E	63.3	18 veh.	8 veh.
2. Bryant Street / 24th Street	B	14.4	C	28.8	4 veh.	6 veh.
3. Folsom Street / 16th Street	B	17.9	B	19.0	14 veh.	11 veh.
4. Folsom Street / 24th Street	B	15.1	B	15.3	9 veh.	5 veh.
5. S. Van Ness Avenue /16th Street	D	40.7	C	25.5	6 veh.	11 veh.
6. S. Van Ness Avenue / 24th Street	B	15.9	B	16.1	5 veh.	7 veh.
7. Mission Street / 16th Street	F	>80	D	53.0	4 veh. [3]	5 veh.
8. Mission Street/ 24th Street	D	36.8	D	50.5	4 veh.	4 veh.

Notes:

[1] Peak direction north-south movement is northbound during the AM peak hour and southbound during the PM peak hour.

[2] Theoretical queue length based on TRAFFIX analysis software of stand-alone intersection. Actual queue length will differ due to upstream metering effect (at adjacent signalized and stop-controlled intersections) and other site-specific factors. As provided here, the queue length values are intended to provide an "order-of-magnitude" comparison of existing queues and the impact of potential lane reductions.

[3] Reflects PM peak hour southbound movement on Mission Street. Eastbound approach on 16th Street would experience the longest delay and queue length.

Source: Fehr & Peers, 2009

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CONCLUSIONS

Based on the findings described above:

Intersection Level of Service

- Under Alternatives 1 and 3, impacts to intersection LOS would be less than significant based on City of SF Guidelines.
    - Although queue lengths would increase in the peak direction (northbound during the AM peak and southbound during the PM peak) on Folsom Street, average delays would remain acceptable.
- Significant impacts to intersection LOS on South Van Ness Avenue would result from Alternative 2. However, such impacts could be avoided with Mitigated Alternative 2 (provision of an additional peak direction lane by creating parking tow-away lanes, northbound in the AM and southbound in the PM).

Traffic Diversion

- Diversion of traffic to parallel corridors is not anticipated to result in significant LOS impacts under Alternatives 1 or 3, or Mitigated Alternative 2 ("3+1" lane configuration on South Van Ness):
    - Traffic is unlikely to divert to Mission or Bryant Streets based on the analysis of traffic volumes, queue lengths, LOS and field observations conducted by Fehr & Peers and Nelson\Nyggard. The existing peak queue lengths at Mission/16th, Mission/24th, and Bryant/16th should serve to discourage the use of those two corridors as an alternate route. In addition, travel speeds[7] appear to be slower on Mission and Bryant Streets, particularly in comparison with South Van Ness Avenue. Therefore, traffic diversion under all alternatives is likely to be limited to the Folsom and South Van Ness corridors.
    - For purposes of the initial draft of this analysis, the LOS analysis did not assume that diversion would occur, in order to provide a worst-case assessment of LOS impacts on the selected corridors (with no diversion of traffic from the selected corridor).
    - Under Alternative 1 ("4 to 3" conversion on Folsom Street), increased queue length would cause a portion of traffic to divert to South Van Ness Avenue. However, such diversion would be limited, given worse LOS at South Van Ness/16th (relative to intersections on Folsom). Measures to reduce delay at the Folsom/16th intersection (or excluding Folsom/16th from the proposed lane conversion) should reduce the likelihood of such diversion occurring.
    - Under Alternative 2 ("4 to 3" conversion on South Van Ness Avenue), increased queue length would likely cause a substantial portion of traffic to divert to Folsom Street. Given current and future excess capacity, diverted traffic could be accommodated on Folsom Street without degrading LOS, but could impact transit service.

[7] Further review of travel speed data is recommended, if available, to augment this report.

- Under Mitigated Alternative 2 ("3+1" conversion on South Van Ness), the likelihood of traffic diversion is reduced in the peak direction. However, diversion of traffic would be expected in the off-peak direction (southbound in the AM, and northbound in the PM). Such diversion would likely be limited to Folsom Street, given excess capacity on that corridor (based on the current Folsom Street four-lane configuration).

Effects on Transit

- Under Alternatives 1 or 3, the proposed "4 to 3" conversion on Folsom Street (south of 16th Street) could be carried out without significantly increasing transit travel time on the Folsom Street corridor. Key factors that that could serve to reduce effects on travel time for buses are as follows:

  - The effective installation of signal pre-emption measures (not just signal "priority" measures) to extend the "green" signal cycle when all buses approach, could ensure that buses would rarely be required to stop for a red light along Folsom Street. Since intersection delay is largely limited to the queues that form when vehicles must stop for a "red" traffic signal, effective pre-emption measures could reduce potential delays to transit resulting from increased queue lengths. By extending the "green" signal cycle when buses approach, queues should be effectively dispersed prior to the arrival of each bus (assuming that buses would often arrive at the end of the cycle, which may be the case if buses are frequently triggering the signal over-ride to extend the cycle).

  - Provision of center left-turn lanes (as proposed with the "four-to-three" lane conversion) should further ensure that queues are cleared when buses approach. This would occur by eliminating the delay caused when vehicles attempt to make a left-turn within the travel lane (as required by the current configuration).

  - Due to the high volume of east-west traffic on 16th Street (including east-west transit service), it is not likely to be feasible to allow for full signal pre-emption for buses at the Folsom Street/16th Street intersection. Therefore, the proposed "four-to-three" conversion would result in added delay to buses at that intersection.

  - The proposed "4 to 3" conversion for a short segment of Bryant Street (under Alternative 3) is unlikely to result in significant delays to transit.

- The proposed "4 to 3" conversion on South Van Ness Avenue could affect transit operating speeds, due to the potential diversion of traffic to Folsom Street. The likelihood of significant diversion is reduced under "Mitigated Alternative 2", in which a second through lane would be provided in the peak direction.

- Potential effects on transit could be further reduced or avoided by the following improvements discussed in the Nelson\Nygaard memo:

  – Queue jump lanes and/or "bus bulbouts" at bus stops, to reduce the time needed for buses to re-enter the travel lane following each stop. This would require

consideration of modifying the current City prohibition on installing "bus bulbouts" on streets with just one through lane.

- Provision of right-turn lanes[8] at key intersections (such as 16th Street) to reduce delays to through traffic (including buses) that occur when right-turning vehicles must yield to pedestrians using adjacent crosswalk(s). Provision of right-turn lanes could be limited to peak or daytime hours, to minimize the effect on on-street parking supply.

[8] Based on input from City staff, right-turn lanes should not be considered due to potential conflicts with the pedestrian-enhancement goals of the Mission Streetscape Plan.

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Mission Streetscape

ALTERNATIVES 1 & 3: FOLSOM AND BRYANT RECOMMENDED LANE CONFIGURATIONS

July 2009
SF09-0447\graphics\0447-5 Folsom

FIGURE 5

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Mission Streetscape

ALTERNATIVE 2: SOUTH VAN NESS RECOMMENDED LANE CONFIGURATION

July 2009
SF09-0447\graphics\0447-6 SVanNess

FIGURE 6