

# Memorandum

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To	Andrew Heidel, Camille Guiriba (SFCTA)	Date	January 10, 2019
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From	Megan Gee, Justin Walker (Arup)	File reference	4-05
Subject	Lombard Crooked Street Data Collection- Reservation and Pricing Scenario Performance		

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As part of the Lombard Crooked Street Reservation and Pricing Study, this memorandum estimates the performance of two proposed reservation and pricing scenarios considered for the “Crooked Street” block of Lombard Street. The performance of the two proposed scenarios and existing conditions is evaluated in accordance with key project goals.

These estimates are based upon direct field observations of pedestrian and car activity from August through September 2018 and a stated-preference intercept survey administered to visitors driving Crooked Street in August 2018.

## 1 Project Goals and Metrics

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For the purposes of this analysis, existing conditions and two proposed reservation and pricing scenarios are evaluated in accordance with the project goals outlined in Table 1.

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**Table 1- Project Goals and Metrics**

GOAL	METRIC	TARGET	
		MINIMUM	IDEAL
Manage automobile congestion	Time vehicle queue extends west past Larkin St (1 block) in each hour of the week	Time vehicle queue extends past Larkin is no more than 15 min in any given hour	Vehicle queue does not extend beyond 1100 block of Lombard St
Maintain the livability of the surrounding neighborhood	Revenue generated	Revenue beyond operating costs greater or equal to current cost of services (PCOs, ambassadors)	Revenue beyond operating costs greater or equal to cost of expanded services such as PCOs, Police Officers, and related to manage impact of visitors on neighborhood
Manage pedestrian congestion	Percentage of pedestrians lingering in intersection crosswalks for excessive periods of time (i.e., crossing significantly more slowly than a typical walking speed [3 ft/s])	Less than 15 percent of pedestrians linger in crosswalks for excessive periods of time	Less than 10 percent of pedestrians linger in crosswalks for excessive periods of time
Ensure traffic safety	Extent to which pick-ups/ drop-offs block cable cars, pedestrians/ crosswalks, or automobiles	Pick-ups and drop-offs do not block travel lanes or sidewalks more than 15 min in any given hour	All pick-ups and drop-offs do not block travel lanes or sidewalks
Implement a financially viable solution	Revenue generated	Revenue covers basic operations and maintenance costs of the pricing and reservations system	Revenue beyond operating costs greater or equal to cost of expanded services such as PCOs, Police Officers, and related to manage impact of visitors on neighborhood
Preserve tourism at a sustainable level	Number of visitors per day	Number of visitors that allows the system to meet other minimum targets, given proposed improvements	Number of visitors that allows the system to meet other ideal targets, given proposed improvements

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## 2 Reservation and Pricing Scenarios

Existing conditions and two proposed reservation and pricing scenarios are summarized in Table 2.

**Table 2- Project Scenarios**

	SCENARIOS		
	EXISTING	SCENARIO 1	SCENARIO 2
Hours of Toll + Reservation Operation	No Toll or Reservation	24 / 7	9 AM – 9 PM, All Days
Toll Rates	No Toll	\$5 All Times	\$5 Tues – Fri \$10 Sat – Mon
SF Resident Exemption	n/a	None	None

Key supporting assumptions include:

- During hours when a reservation and pricing system is in operation, 40 reservation slots will be offered per 30-minute time interval, with time intervals staggered every 15 minutes. (For example, 40 reservation slots will be offered for each of the following time windows: 1:00 to 1:30 PM, 1:15 to 1:45 PM, 1:30 to 2:00 PM, 1:45 to 2:15 PM, etc.)
- A fine will be applied to motorists that attempt to drive the Crooked Street without valid toll payment and reservations; this fine is assumed to be sufficiently high such that noncompliance with the reservation and pricing system will be limited.
- With the introduction of a reservation and pricing system, a portion of car visitors will opt to no longer drive the Crooked Street. Some of these visitors divert to visiting the Crooked Street via walking, biking, or transit, visiting via being dropped-off, or simply not visiting the Crooked Street at all. The proportions of these estimated diversions are based on the stated-preference intercept survey administered to car visitors to the Crooked Street.

## 3 Scenario Performance

Weekly profiles are presented in Figures 1a through 2f below, indicating, for each scenario:

- Typical existing vehicles driving the Crooked Street
- Typical existing visitors driving the Crooked Street
- Proposed toll schedule
- Estimated tolled vehicles driving the Crooked Street and estimated vehicles diverted from driving by the proposed toll

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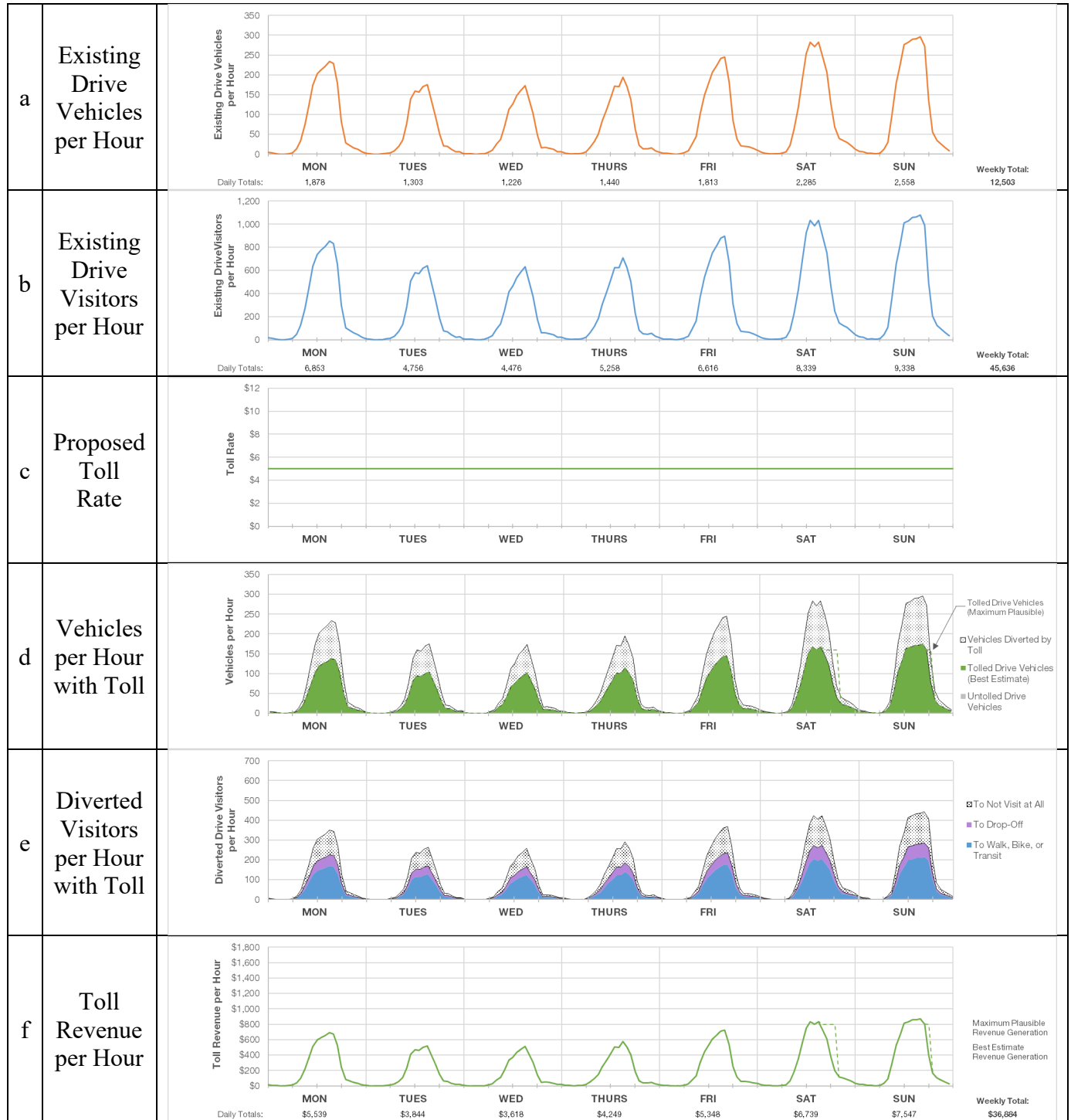
- Estimated number of visitors diverted to visiting the Crooked Street via walking, biking, or transit, to visiting via being dropped-off, or simply not visiting the Crooked Street at all.
- Estimated weekly profile of hourly toll revenue

Figures 1a through 1f below summarize the performance of Scenario 1 and Figures 2a through 2f below summarize the performance of Scenario 2.

These estimates are based on field observations of pedestrians and car activity observed between August and October 2018. These observations subsequently informed estimates of unconstrained demand for driving the Crooked Street. However, during some observed times (principally Saturday and Sunday afternoons), the true unconstrained demand could not be estimated because of excessive car queuing (at least three blocks upstream of the Crooked Street beyond Van Ness Ave). Accordingly, there is some uncertainty of the assumed unconstrained demand during those times of the week. During these times, “maximum plausible estimates” of drive visitor vehicles, diverted visitors, and toll revenue are also presented, in addition to the “best estimates”. These “maximum plausible estimates” assume that all available reservation slots (160 per hour) are claimed during these periods of high demand and represent an upper feasible limit to estimated activity at these times.

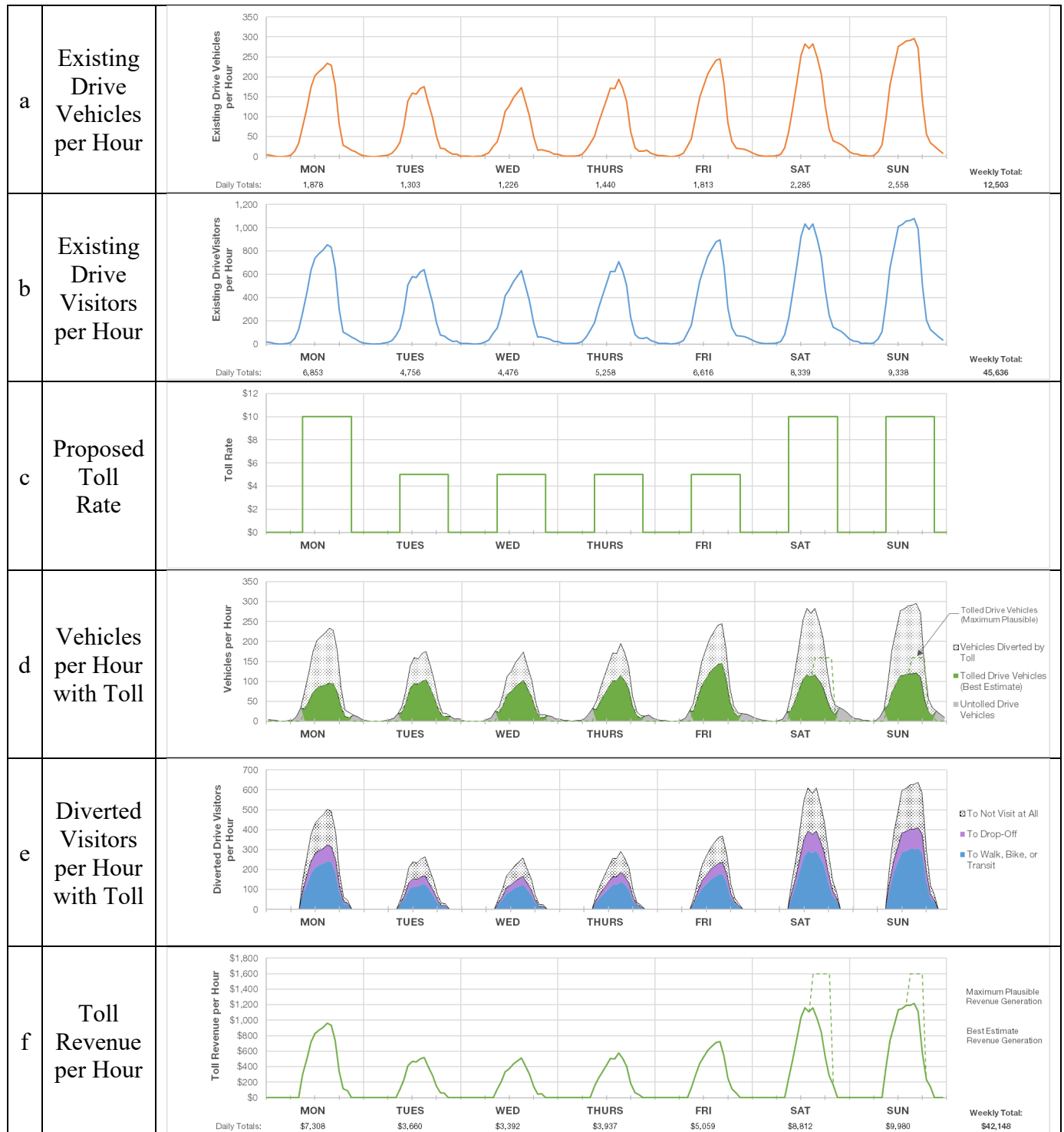
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## Figure 1- Scenario 1 Performance



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## Figure 2- Scenario 2 Performance



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## 4 Metrics

Table 3 below summarizes how existing conditions and the two proposed toll reservation scenarios meet project goals. Green shading indicates that a scenario meets the project metric target and therefore fulfills a particular project goal. Red shading indicates that scenario does not meet the project metric target to fulfill a particular project goal. Yellow shading indicates that a project goal has no specific corresponding project metric target for the project scenario to meet.

**Table 3- Scenario Performance**

				SCENARIOS		
				EXISTING	SCENARIO 1	SCENARIO 2
Hours of Toll + Reservation Operation				No Toll or Reservation	24 / 7	9 AM – 9 PM, All Days
Toll Rates				No Toll	\$5 All Times	\$5 Tues – Fri \$10 Sat – Mon
SF Resident Exemption				n/a	None	None
		TARGET		PERFORMANCE		
GOAL	METRIC	MINIMUM	IDEAL	EXISTING	SCENARIO 1	SCENARIO 2
Manage automobile congestion	Time vehicle queue extends west past Larkin St (1 block) in each hour of the week	Time vehicle queue extends past Larkin is no more than 15 min in any given hour	Vehicle queue does not extend beyond 1100 block of Lombard St	Vehicle queue extends upstream of Larkin St at least six hours per day each day of the week.	Weekly peak hour arrival flow (weekend afternoons) is 175 veh/hr; average queue will not reach halfway to Larkin St. For average arrival flows less than 210 veh/hr, average queue will not extend more than 8 vehicles.)	Weekly peak hour arrival flow (weekend afternoons) is 160 veh/hr; average queue will not reach halfway to Larkin St. For average arrival flows less than 210 veh/hr, average queue will not extend more than 8 vehicles.)
Maintain the livability of the surrounding neighborhood	Revenue generated	Revenue beyond operating costs greater or equal to current cost of services (PCOs, ambassadors)	Revenue beyond operating costs greater or equal to cost of expanded services such as PCOs, Police Officers, and related to manage impact of visitors on neighborhood	No revenue generated.	\$37K revenue generated per week.	\$42K revenue generated per week.

(Table 3 continued on next page)

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**Table 3- Scenario Performance, continued**

				SCENARIOS		
				EXISTING	SCENARIO 1	SCENARIO 2
Hours of Toll + Reservation Operation				No Toll or Reservation	24 / 7	9 AM – 9 PM, All Days
Toll Rates				No Toll	\$5 All Times	\$5 Tues – Fri \$10 Sat – Mon
SF Resident Exemption				n/a	None	None
				PERFORMANCE		
TARGET				PERFORMANCE		
GOAL	METRIC	MINIMUM	IDEAL	EXISTING	SCENARIO 1	SCENARIO 2
Manage pedestrian congestion	Percentage of pedestrians lingering in intersection crosswalks for excessive periods of time (i.e., crossing significantly more slowly than a typical walking speed [3 ft/s])	Less than 15 percent of pedestrians linger in crosswalks for excessive periods of time	Less than 10 percent of pedestrians linger in crosswalks for excessive periods of time	At Lombard St & Hyde St, only approximately 15% of pedestrians occupy the crosswalks linger in the crosswalks. At Lombard St & Leavenworth St, however, over 45% of pedestrians linger in the crosswalk.	Without interventions at the two study intersections, 15% and 45% of pedestrians would be expected to linger in crosswalks at the intersections of Lombard St & Hyde St and Lombard St & Leavenworth, respectively. In addition, greater volumes of pedestrians overall would be expected. In weekly peak hour (Saturday afternoon), 290 visitors divert from driving Crooked Street to visiting as a pedestrian, thereby adding to overall crowding of pedestrian space.	Without interventions at the two study intersections, 15% and 45% of pedestrians would be expected to linger in crosswalks at the intersections of Lombard St & Hyde St and Lombard St & Leavenworth, respectively. In addition, greater volumes of pedestrians overall would be expected. In weekly peak hour (Saturday afternoon), 410 visitors divert from driving Crooked Street to visiting as a pedestrian, thereby adding to overall crowding of pedestrian space.
Ensure traffic safety	Extent to which pick-ups/ drop-offs block cable cars, pedestrians/ crosswalks, or automobiles	Pick-ups and drop-offs do not block travel lanes or sidewalks more than 15 min in any given hour	All pick-ups and drop-offs do not block travel lanes or sidewalks	Pick-up / drop-off activity frequently obstructs pedestrians, cable car, and other car traffic.	In weekly peak hour (weekend afternoons), 70 visitors diverted from driving Crooked Street to visiting by getting dropped off; obstructing pick-up / drop-off activity expected to increase accordingly.	In weekly peak hour (weekend afternoons), 100 visitors diverted from driving Crooked Street to visiting by getting dropped off; obstructing pick-up / drop-off activity expected to increase accordingly.
Implement a financially viable solution	Revenue generated	Revenue covers basic operations and maintenance costs of the pricing and reservations system	Revenue beyond operating costs greater or equal to cost of expanded services such as PCOs, Police Officers, and related to manage impact of visitors on neighborhood	No revenue generated.	\$37K revenue generated per week.	\$42K revenue generated per week.
Preserve tourism at a sustainable level	Number of visitors per day	Number of visitors that allows the system to meet other minimum targets, given proposed improvements	Number of visitors that allows the system to meet other ideal targets, given proposed improvements	Presently, 21,000 people visit the Crooked Street on the average day (6,500 average daily drive visitors and 14,500 average daily walk visitors).	20,000 people will visit the Crooked Street on an average day (a five percent reduction overall to 4,000 daily drive visitors and 16,000 daily walk visitors).	20,000 people will visit the Crooked Street on an average day (a five percent reduction overall to 3,700 daily drive visitors and 16,300 daily walk visitors).



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Both proposed reservation and pricing scenarios substantially resolve the extreme car queuing on Lombard Street upstream of the Crooked Street that is present throughout most of the week. With the proposed assignment of reservation slots, queuing is estimated not to extend back to Larkin St at any time during a typical week.

Throughout the week, the eastern crosswalk of the intersection of Lombard St & Leavenworth St, has a particularly high proportion of pedestrians (nearly 50 percent) lingering in the crosswalk (i.e., crossing more slowly than a benchmark of 3 feet per second). Both scenarios are estimated to increase pedestrian visitor traffic to the Crooked Street during weekend peak periods by approximately twenty percent. Without intervention, this is expected to slightly worsen the existing difficulties associated with pedestrians lingering in crosswalks, unnecessarily blocking car traffic, and possibly endangering themselves or others. Potential interventions to accommodate elevated pedestrian volumes include further enforcement of pedestrian crossings with increased Parking Control Officer (PCO) and sworn law enforcement officer presence, and / or the addition of one or more bulb-outs, providing more space for pedestrians to pause and take photos without standing in the street (this could also be a temporary solution using paint and planters).

Per the “best estimate” of toll revenue, Scenarios 1 and 2 are estimated to generate approximately \$37,000 and \$42,000 in toll revenue respectively during a typical week. Per a “maximum plausible” estimate (under which all available reservation slots during peak weekend hours are filled), Scenarios 1 and 2 are estimated to generate approximately \$39,000 and \$49,000 in toll revenue respectively during a typical week.

Overall, both scenarios are estimated to modestly decrease overall visitor traffic to the Crooked Street by approximately five percent (each decreasing drive visitors by approximately forty percent but increasing pedestrian visitors by approximately ten percent).