A Tale of Two Modes in Santa Monica

Pedestrian Scrambles in Action

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Session 9B: Complete Streets: Sample Projects
June 21, 2017
Presentation Outline

I. Pedestrian Scramble Project
II. Scramble Safety Analysis
III. Downtown Timing Study
IV. Signal Timing Study Findings
V. Project Summary
Pedestrian Scrambles on the Radar

❖ Santa Monica Pedestrian Action Plan
  o Walking core part of City’s identity
  o Prioritize walking
    • Vehicle flow tradeoff for safety
  o Vision Zero
    • Designs that promote safety and minimize risk
  o Identifies innovative strategies
    • Pedestrian scrambles
Pedestrian Scrambles

❖ Exclusive signal phase
  o All traffic is stopped
  o Peds cross in all directions, including diagonally
❖ > 1,200 peds/day
  o Significant collision reduction
❖ Safety Countermeasure
  o 70% ped collisions are violation of driver
  o -45% ped/vehicle crash rate
❖ Higher delay for peds and other modes
Scramble Intersection Operation: Vehicle and pedestrian signal phases are completely separated
Santa Monica 2037?
Downtown Ped Scramble Project

❖ Project objectives

1. Establish network of 12 scramble intersections in the City’s Downtown area
   • Reinforce ‘Pedestrian First’ Downtown
   • Reduce conflicts between pedestrians and vehicles

2. Retime 41 Downtown traffic signal grid to accommodate scrambles
Project Location Map
Scramble Pedestrian Volumes

Weekend Peak-Hour Pedestrian Volume (July 2015)

- COLORADO AVE & 4TH ST: 501
- COLORADO AVE & 2ND ST: 497
- COLORADO AVE & OCEAN AVE: 3,478
- BROADWAY & 4TH ST: 2,003
- BROADWAY & 2ND ST: 3,178
- SANTA MONICA BLVD & 4TH ST: 2,791
- SANTA MONICA BLVD & 2ND ST: 1,472
- ARIZONA AVE & 4TH ST: 1,245
- ARIZONA AVE & 2ND ST: 1,130
- WILSHIRE BLVD & 4TH ST: 1,643
- WILSHIRE BLVD & 3RD ST: 1,121
- WILSHIRE BLVD & 2ND ST: 500
Scramble Markings

X Markings

Full Markings

Colored Artwork

Special Pavement
Scramble Markings – Aerial View
Scramble Safety – Illegal Crossings

<table>
<thead>
<tr>
<th>Time Period</th>
<th>October 2015 Weekday (Pre-Scramble)</th>
<th>August 2016 Weekend (Scramble)</th>
<th>October 2016 Weekday (Scramble)</th>
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<tbody>
<tr>
<td></td>
<td># Illegal</td>
<td>% Illegal</td>
<td># Illegal</td>
</tr>
<tr>
<td>AVG AM 7:30-9:30</td>
<td>21</td>
<td>3%</td>
<td>88</td>
</tr>
<tr>
<td>AVG PM 5:00-7:00</td>
<td>17</td>
<td>2%</td>
<td>266</td>
</tr>
<tr>
<td>Average</td>
<td>19</td>
<td>2%</td>
<td>177</td>
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</table>

- Illegal Crossings
  - High percentage of illegal crossings in # and % terms
- Seasonal Variation
  - No clear indication of increasing compliance from August to October
- Relationship to Overall Pedestrian Volume
  - No indication that changes in overall volume account for changes in amount of illegal movements
Scramble Safety – Ped-Vehicle Crashes

- No clear trend that traffic incidents and injuries are similar to previous levels
- Small sample size of pedestrian-vehicle incidents not enough to identify scramble impact

<table>
<thead>
<tr>
<th>Intersection</th>
<th>2013</th>
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<th>2015</th>
<th>2016</th>
<th>Intersection Total</th>
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<td>OCEAN AVE / COLORADO AVE</td>
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<td>2ND ST / BROADWAY</td>
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<td>1</td>
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<tr>
<td>2ND ST / COLORADO AVE</td>
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<td></td>
<td>1</td>
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<tr>
<td>2ND ST / SANTA MONICA BLVD</td>
<td>1</td>
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<td>1</td>
<td></td>
<td>2</td>
</tr>
<tr>
<td>2ND ST / WILSHIRE BLVD</td>
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<td></td>
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<tr>
<td>2ND ST / ARIZONA AVE</td>
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<td></td>
</tr>
<tr>
<td>3RD STREET PROM / WILSHIRE</td>
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<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>4TH ST / ARIZONA AVE</td>
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<td></td>
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<td>1</td>
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<tr>
<td>4TH ST / BROADWAY</td>
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<td>1</td>
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<tr>
<td>4TH ST / COLORADO AVE</td>
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</table>

Yearly Total: 5 0 2 1 8
Scramble Safety Analysis

❖ Higher Amount of illegal crossings compared to pre-scramble
❖ Type of illegal scramble crossings typically less dangerous conflict (left and right turn compared to thru) than in pre-scramble conditions
❖ Long Wait times may be reason for increased illegal crossings
❖ Preliminary Safety Data does not indicate safety conditions have improved or worsened
Downtown Traffic Signal Timing Study

❖ Phase I – Develop 3 optimized traffic signal timing plans
  o Base plan
  o Inbound plan
  o Outbound plan

❖ Phase II -- Implementation and fine tuning of traffic signal timing plans

❖ Phase III – Before and after study report
Signal Timing Study Area
Signal Timing Project Approach

1. Update the existing Synchro model to match current field conditions and add the 12 pedestrian scrambles.

2. Cycle-length analysis and selection using the updated Synchro model.

3. Analyze traffic operations on the roadway network with the selected cycle length and vehicle splits using SimTraffic.

4. Development of the time-space diagrams with the use of the Tru-Traffic software from imported Synchro model data.

5. Field observation and measurement of system performance to validate the operation predicated by the model.
Base Plan – Balanced Flow

Before:
120 sec / 90 sec

After:
120 sec / 100 sec

120s / 60s Cycle

150s Cycle
Inbound Plan – Directional Flow

Before:
180 sec / 90 sec

After:
120 sec / 100 sec

120s / 60s Cycle

150s Cycle
Outbound Plan – Directional Flow

Before: 180 sec / 90 sec
After: 120 sec / 100 sec

120s / 60s Cycle
150s Cycle
Scramble Pedestrian Delay

❖ Wait Time
  o scrambles inherently increase wait times for all users; walkers, bikers, and drivers

❖ Incentivizes Jaywalking?
  o Increase in illegal crossings likely from long wait time + less visible vehicle left-turn conflict
Scramble Pedestrian Delay

Avg. X-ing Time $\Delta = +8.1s$
Avg. Ped Delay $\Delta = +56\%$

Ocean @ Colorado
2nd @ Colorado
2nd @ Santa Monica
2nd @ Arizona
4th @ Arizona
4th @ Santa Monica
4th @ Broadway
4th @ Colorado
3rd @ Wilshire
2nd @ Wilshire
2nd @ Broadway
2nd @ Santa Monica
2nd @ Arizona
4th @ Wilshire
4th @ Broadway
4th @ Santa Monica
4th @ Arizona
Ocean @ Colorado

Post-Scramble
Pre-Scramble
## Before / After Results

<table>
<thead>
<tr>
<th>Corridor</th>
<th>Direction</th>
<th>Scenario</th>
<th>Travel Time (sec)</th>
<th>Delay (sec)</th>
<th>Number of Stops</th>
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<tbody>
<tr>
<td>Wilshire Blvd</td>
<td>EB</td>
<td>Before</td>
<td>876</td>
<td>592</td>
<td>16</td>
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<tr>
<td>Arizona Ave</td>
<td></td>
<td>After</td>
<td>881</td>
<td>595</td>
<td>13</td>
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<tr>
<td>Santa Monica Bl</td>
<td></td>
<td>Change</td>
<td>1%</td>
<td>1%</td>
<td>-22%</td>
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<tr>
<td>Broadway</td>
<td>WB</td>
<td>Before</td>
<td>1009</td>
<td>723</td>
<td>15</td>
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<tr>
<td></td>
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<td>After</td>
<td>937</td>
<td>657</td>
<td>17</td>
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<td>-9%</td>
<td>12%</td>
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<td>Ocean Ave</td>
<td>NB</td>
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<td>993</td>
<td>553</td>
<td>13</td>
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<td>2nd St</td>
<td></td>
<td>After</td>
<td>1283</td>
<td>842</td>
<td>15</td>
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<tr>
<td>4th St</td>
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<td>Change</td>
<td>29.2%</td>
<td>52.3%</td>
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<td>5th St</td>
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<td>6th St</td>
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<td>7th St</td>
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<tr>
<td>Lincoln BL</td>
<td>SB</td>
<td>Before</td>
<td>1684</td>
<td>1243</td>
<td>18</td>
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<td>After</td>
<td>1393</td>
<td>953</td>
<td>17</td>
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<td>Change</td>
<td>-17.3%</td>
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<td><strong>Total</strong></td>
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<td></td>
<td><strong>-1.5%</strong></td>
<td><strong>-2.1%</strong></td>
<td><strong>-1.3%</strong></td>
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</table>
4th Street Travel-Time Data

120 sec.
Signal Timing Study Findings

- Higher delay for pedestrian and other modes
- Vehicle flow tradeoff for safety with ‘Pedestrian First’ Downtown
- Locations with more than two phases are a bottleneck
- Happy cycle length only went from 90 to 100 for majority of grid
- Data shows some improvements and some extra delay . . . City still OK with results
Project Summary

❖ Safety and place making were driving forces
❖ Long learning curve
❖ Not consistent from a striping standpoint due to existing intersection treatments
  o Consistency would help
  o Initial data does not show less compliance at non-striped locations
❖ Right-turn-on red working OK
❖ Scrambles probably not needed at all 12 locations . . . Choose wisely