Development of an Effective Truck Route Signage Program for the City of Tampa

Pei-Sung Lin, Ph.D., P.E., PTOE, FITE
Director
ITS, Traffic Operations and Safety Program

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2. Objectives
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4. Description of Test Site Areas and Intersections
5. Development of Truck Route Signage and Experiment Plan
6. Data Collection and Analysis
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1. Background and Introduction

- City of Tampa (COT) contains numerous major freight generators and destinations
  - a seaport
  - a rail intermodal yard
  - Cargo-capable Tampa International Airport, and
  - a wide variety of logistic activity centers (LACs)
- 36 Million Tons Freight Annually moves through Port Tampa Bay (Port Tampa Bay Masterplan Vision 2040)

Residents expressed concerns regarding truck traffic on non-truck routes.

It is important to balance between City’s economy and quality of life of residents.

All parties with an interest in trucking in the city would like to keep truck traffic on appropriate roadways such as designated truck routes.

2. Objectives

- Conduct research and field investigations to determine best practices and standards for an effective truck route signage program for the City of Tampa
- Establish standards for sign types, sizes, and locations for truck route signage
- Perform before-and-after data analysis for a pilot implementation
- Evaluate the effectiveness of the proposed truck route signage

3. Literature Review

**Determined Truck Route Signage to Enhance Mobility**

- Extensive literature review on truck route signage to guide truck drivers to travel on the designated truck route system to increase their compliance
- Development of an Effective Truck Route Signage Program for the City of Tampa
  - Three major factors to develop an effective Truck Route Signage:
    1. Design of the signage
      - Signage texts and/or symbols
      - Signage sizes and colors
    2. Strategic placement of the signage
    3. Operations – Positive (Advance Guidance) and Negative (Advance Prohibition and Prohibition) on non-truck routes leading to truck routes
3. Literature Review

Aimed to obtain the following contents:

- Design of truck route signage, including size, text, symbol, color, etc.
- Location of truck route signage (strategic location and distance to adjacent intersection)
- Operation of truck route signage, including positive direction guidance, prohibition on non-truck routes, or combinations
- Evaluation of effectiveness of truck route signage
- Standards, policies, guidance, and programs for truck route signage in other states, counties, and cities
3. Literature Review

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3. Literature Review

Study Areas

Residential areas with frequent truck violations and resident’s complaints

**Area 1: Forest Hills Neighborhood**

**Area 2: W El Prado Boulevard Neighborhood**

**Area 3: South Tampa Bay Area**
4. Description of Test Site Areas and Intersections

Test Site Area 1: Forest Hills Neighborhood

Comprise intersections:
- E Fowler Avenue & N Florida Avenue
- W Busch Boulevard & N Boulevard Street
- W Busch Boulevard & N Armenia Avenue

Test Site Area 2: W El Prado Boulevard Neighborhood

Comprise intersections:
- S Manhattan Avenue & W El Prado Boulevard
- S Manhattan Avenue & W Euclid Avenue
- S Dale Mabry Highway & W El Prado Boulevard
- S Dale Mabry Highway & W Euclid Avenue
4. Description of Test Site Areas and Intersections

**Test Site Area 3: South Tampa Bay Area**

Comprise intersections:

- Interbay Boulevard & S MacDill Avenue

5. Development of Truck Route Signage and Experiment Plan

**Truck Route Signage Design**

- "To Designated Truck Route" Advance Guidance Sign
- Specified "Truck Route Prohibition" Advance Guidance Sign
- "Designated Truck Route" Advance Guidance Sign
- "No Trucks" Prohibition Sign
5. Development of Truck Route Signage and Experiment Plan

### Placement of Proposed Truck Route Related Signage – Sample Case 1 (Northbound)

- **Stage 1**: “To Designated Truck Route” – Approx. 200 ft. from the intersection
- **Stage 2**: Specified “Truck Route Prohibition” – Approx. 150 ft. from the intersection
- **Stage 3**: “Designated Truck Route” – Approx. 50 ft. from the intersection
- **Stage 4**: “Truck Prohibition” – At far side of the intersection

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### Placement of Proposed Truck Route Related Signage – Sample Case 2 (Southbound)

- **Stage 1**: “To Designated Truck Route” – Approx. 200 ft. from the intersection
- **Stage 2**: “Designated Truck Route” – Approx. 50 ft. from the intersection
5. Development of Truck Route Signage and Experiment Plan

Placement of Proposed Truck Route Related Signage – Sample Case 3 (East/West-bound)

- **Stage 1**: Specified “Truck Route Prohibition” – Approx. 200 ft. from the intersection
- **Stage 2**: Specified “Truck Route Prohibition” – Approx. 50 ft. from the intersection

N Armenia Ave @ W Busch Blvd
5. Development of Truck Route Signage and Experiment Plan

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W Busch Boulevard & N Boulevard Street

N Armenia Ave @ W Busch Blvd
5. Development of Truck Route Signage and Experiment Plan

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5 Manhattan Avenue & W Euclid Avenue
5. Development of Truck Route Signage and Experiment Plan

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Truck route

5 Dale Mabry Highway & W El Prado Boulevard

Dale Mabry Highway & W Euclid Avenue
5. Development of Truck Route Signage and Experiment Plan

6. Data Collection and Analysis

Data Collection
- The data was obtained from counter tubes which was capable of collecting vehicle classification data along with the traffic counts.

The data contain:
- Hourly traffic/truck volume
- Date/time
- Intersection characteristics (lane configuration, number of truck routes, etc.)
- Truck characteristics [Truck types such as Single Unit Trucks (SUT), Tractor+ Semi-Trailer Combinations (TSC), and Tractor + Multi-Trailer Combinations (TMC)]

The expected outputs of the data analysis included:
- Truck reduction rates (percentages) on non-truck routes due to utilization of the new truck route signage, and statistical analysis
6. Data Collection and Analysis

Before and After Data Analysis

Sample Data Compilation for Before-After Data

<table>
<thead>
<tr>
<th>Intersection Name</th>
<th>Day</th>
<th>Date Type</th>
<th>Single Unit Trucks (SUT)</th>
<th>SUT Difference</th>
<th>Tractor + Multi-Trailer Combinations (TMC)</th>
<th>Total Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dale Mabry at Euclid EB</td>
<td>Monday</td>
<td>Before</td>
<td>1365</td>
<td>-785</td>
<td>3</td>
<td>1636</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After</td>
<td>520</td>
<td>64</td>
<td>0</td>
<td>584</td>
</tr>
<tr>
<td></td>
<td>Tuesday</td>
<td>Before</td>
<td>1479</td>
<td>-924</td>
<td>3</td>
<td>1845</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After</td>
<td>515</td>
<td>85</td>
<td>0</td>
<td>600</td>
</tr>
<tr>
<td></td>
<td>Wednesday</td>
<td>Before</td>
<td>3573</td>
<td>-1011</td>
<td>5</td>
<td>1972</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After</td>
<td>502</td>
<td>91</td>
<td>0</td>
<td>593</td>
</tr>
<tr>
<td></td>
<td>Thursday</td>
<td>Before</td>
<td>1266</td>
<td>-799</td>
<td>1</td>
<td>1530</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After</td>
<td>527</td>
<td>263</td>
<td>0</td>
<td>608</td>
</tr>
<tr>
<td></td>
<td>Friday</td>
<td>Before</td>
<td>3627</td>
<td>-1119</td>
<td>4</td>
<td>2064</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After</td>
<td>508</td>
<td>423</td>
<td>0</td>
<td>593</td>
</tr>
<tr>
<td></td>
<td>Saturday</td>
<td>Before</td>
<td>621</td>
<td>-325</td>
<td>3</td>
<td>755</td>
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<tr>
<td></td>
<td></td>
<td>After</td>
<td>296</td>
<td>26</td>
<td>0</td>
<td>334</td>
</tr>
<tr>
<td></td>
<td>Sunday</td>
<td>Before</td>
<td>432</td>
<td>-229</td>
<td>0</td>
<td>511</td>
</tr>
<tr>
<td></td>
<td></td>
<td>After</td>
<td>203</td>
<td>79</td>
<td>0</td>
<td>216</td>
</tr>
</tbody>
</table>

7. Results

Summary on Percent Change of Truck Traffic after Implementation of Recommended Truck Route Signage

<table>
<thead>
<tr>
<th>Intersection Name</th>
<th>Data Type</th>
<th>Percent Change of Single Unit Trucks (SUT)</th>
<th>Percent Change of Tractor + Semi-Trailer Combinations (TSC)</th>
<th>Percent Change of Tractor + Multi-Trailer Combinations (TMC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dale Mabry at El Prado EB</td>
<td>Before</td>
<td>-25%</td>
<td>-65%</td>
<td>-100%</td>
</tr>
<tr>
<td>Dale Mabry at El Prado EB</td>
<td>After</td>
<td>-65%</td>
<td>-100%</td>
<td>-100%</td>
</tr>
<tr>
<td>Armenia at Busch Blvd NB</td>
<td>Before</td>
<td>-40%</td>
<td>-65%</td>
<td>-73%</td>
</tr>
<tr>
<td>Armenia at Busch Blvd NB</td>
<td>After</td>
<td>-65%</td>
<td>-73%</td>
<td>-73%</td>
</tr>
<tr>
<td>Dale Mabry at Euclid EB</td>
<td>Before</td>
<td>-31%</td>
<td>-84%</td>
<td>-100%</td>
</tr>
<tr>
<td>Dale Mabry at Euclid EB</td>
<td>After</td>
<td>-84%</td>
<td>-100%</td>
<td>-100%</td>
</tr>
<tr>
<td>Dale Mabry at Euclid EB</td>
<td>Before</td>
<td>-63%</td>
<td>-78%</td>
<td>-95%</td>
</tr>
<tr>
<td>Dale Mabry at Euclid EB</td>
<td>After</td>
<td>-78%</td>
<td>-95%</td>
<td>-95%</td>
</tr>
<tr>
<td>El Prado at Manhattan EB</td>
<td>Before</td>
<td>-54%</td>
<td>-61%</td>
<td>-100%</td>
</tr>
<tr>
<td>El Prado at Manhattan EB</td>
<td>After</td>
<td>-61%</td>
<td>-100%</td>
<td>-100%</td>
</tr>
<tr>
<td>El Prado at Manhattan EB</td>
<td>Before</td>
<td>-24%</td>
<td>-30%</td>
<td>-100%</td>
</tr>
<tr>
<td>El Prado at Manhattan EB</td>
<td>After</td>
<td>-30%</td>
<td>-100%</td>
<td>-100%</td>
</tr>
<tr>
<td>Euclid at Manhattan EB</td>
<td>Before</td>
<td>-15%</td>
<td>-100%</td>
<td>-100%</td>
</tr>
<tr>
<td>Euclid at Manhattan EB</td>
<td>After</td>
<td>-100%</td>
<td>-100%</td>
<td>-100%</td>
</tr>
<tr>
<td>Euclid at Manhattan WB</td>
<td>Before</td>
<td>-42%</td>
<td>-53%</td>
<td>-93%</td>
</tr>
<tr>
<td>Euclid at Manhattan WB</td>
<td>After</td>
<td>-53%</td>
<td>-93%</td>
<td>-93%</td>
</tr>
<tr>
<td>Fowler at Florida Av WB</td>
<td>Before</td>
<td>-61%</td>
<td>-100%</td>
<td>-100%</td>
</tr>
<tr>
<td>Fowler at Florida Av WB</td>
<td>After</td>
<td>-100%</td>
<td>-100%</td>
<td>-100%</td>
</tr>
<tr>
<td>MacDIE Av at Interbay BL SB</td>
<td>Before</td>
<td>-50%</td>
<td>-62%</td>
<td>-91%</td>
</tr>
<tr>
<td>MacDIE Av at Interbay BL SB</td>
<td>After</td>
<td>-62%</td>
<td>-91%</td>
<td>-91%</td>
</tr>
<tr>
<td>Fowler at Florida Av WB</td>
<td>Before</td>
<td>-54%</td>
<td>-33%</td>
<td>-100%</td>
</tr>
<tr>
<td>Fowler at Florida Av WB</td>
<td>After</td>
<td>-33%</td>
<td>-100%</td>
<td>-100%</td>
</tr>
</tbody>
</table>
7. Results

- Multiple paired two-tail t-tests were used to compare the means between the before-after data for single-unit trucks (SUT), tractor+ semi-trailer combination trucks (TSC), and tractor+ multi-trailer combination trucks (TMC), respectively.

- A two-tail t-test also was performed to compare the means between the before-after data for all combined commercial trucks.

- The quantitative analysis showed an overall **56 percent reduction** in the total number of commercial trucks using non-truck routes after the implementation of the new truck route signage at the eight study sites including:
  - 52 % reduction in Single-unit Trucks (SUT) with 99%,
  - 69 % reduction in Tractor+ Semi-trailer Combination Trucks (TSC), and
  - 96 % reduction in Tractor+ Multi-trailer Combination Trucks (TMC)

- The statistical analysis indicated that these reductions were **all statistically significant at a 99% confidence level.**
8. Conclusions and Recommendations

- Overall, 56% reduction in the total number of commercial trucks using non-truck routes after implementation of the new truck route signage:
  - 52% reduction in Single-unit Trucks (SUT),
  - 69% reduction in Tractor+ Semi-trailer Combination Trucks (TSC), and
  - 96% reduction in Tractor+ Multi-trailer Combination Trucks (TMC)

- Statistical analysis indicated that these reductions were all statistically significant at a 99% confidence level.

- The combination of positive (advance guidance) and negative (advance prohibition and prohibition) truck route signs developed and implemented were highly effective in communicating this message to the truck drivers.

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8. Conclusions and Recommendations

- Substantial increase in the amount of truck traffic traveling on the designated truck route system is projected to improve the mobility of the overall traffic stream as well as truck reliability and travel time.

- The large reduction in truck traffic on non-truck routes via this pilot implementation is also projected to significantly improve safety in residential and non-commercial areas when widely implemented.

- It is recommended that both positive and negative truck route signage, as described in this study, be used for Tampa and other cities, counties, and DOTs to achieve effective truck route signage programs and a high compliance rate from truckers.
Thank You!

Pei-Sung Lin, Ph.D., P.E., PTOE, FITE
Program Director
ITS, Traffic Operations & Safety
Center for Urban Transportation Research, USF
lin@cutr.usf.edu
Phone: 813-974-4910