You Have the Data, Now How to Use IT...

An Sample Analysis of the Implementation of Flashing Yellow Protective Permissive Signals

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Flashing Yellow Signals were Recently Implemented in Burbank, CA

Yellow Turn Signals Raise Controversy

By Timothy Haddy On September 29, 2017

As far back as June 2016 and most recently in March and April of this year, yellow left turn signals were introduced to various intersections throughout Burbank. While it is an effort to increase road safety and improve traffic flow, some drivers have raised concerns, citing confusion as to what the lights mean.

The City of Los Angeles first implemented “protected/permisive” left turn signals as they’re called, over a decade ago. Burbank is among the latest surrounding cities to receive the change.
Comparison of Cities and Traffic Data
Growing, Stable, Landlocked, Commuters, Work at Home v. Government
City-Data.com/city-compare

FYLTA in Scottsdale

Three new sites with FYLTA for **ALL** directions

13 FYLTAs in 2013

YELLOW FLASHING ARROW TURN SIGNALS

<table>
<thead>
<tr>
<th>Location</th>
<th>Anticipated Date</th>
</tr>
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<tbody>
<tr>
<td>Buena Vista St. at Olive Ave.</td>
<td>April 2017</td>
</tr>
<tr>
<td>Buena Vista St. at Verdugo Ave.</td>
<td>November 2017</td>
</tr>
<tr>
<td>Pass Ave. at Alameda Ave.</td>
<td>April 2018</td>
</tr>
<tr>
<td>Pass Ave. at Riverside Dr.</td>
<td>April 2018</td>
</tr>
<tr>
<td>Riverside Dr. at Hollywood Way</td>
<td>June 2018</td>
</tr>
<tr>
<td>Riverside Dr. at Olive Ave.</td>
<td>April 2018</td>
</tr>
<tr>
<td>Olive Ave. at Hollywood Way</td>
<td>June 2018</td>
</tr>
<tr>
<td>Olive Ave. at Lakeside Dr.</td>
<td>June 2018</td>
</tr>
</tbody>
</table>

Watch Out for the New FLAShing Yellow LEFT-TURN ARROW
Flashing Yellow Signals have been in Scottsdale, Az for 10 years--at 13 Intersections*

2 Collisions since 2012 ITE Presentation

Since FYLTA: 5 collisions in 56 Months (1.07 Per Year)

Three Collisions since 2012 ITE Presentation

Since FYLTA: 8 collisions in 55 Months (1.74 Per Year)

Tim Taylor Scottsdale Traffic Study, 2013
Section 4D.26 Signal Indications for Protected/Permissive Mode Left-Turn Movement:

Standard:

A. It shall be capable of displaying the following signal indications: steady CIRCULAR RED, steady CIRCULAR YELLOW, CIRCULAR green, steady left-turn YELLOW ARROW, and left-turn GREEN ARROW. Only one of the three circular indications shall be displayed at any given time. Only one of the two arrow indications shall be displayed at any given time. If the left-turn GREEN ARROW signal indication and the CIRCULAR GREEN signal indication(s) for the adjacent through movement are always terminated together, the steady left-turn YELLOW ARROW signal indication shall not be required.

B. During the protected left-turn movement, the shared signal face shall simultaneously display a left-turn GREEN ARROW signal indication and a circular signal indication that is the same color as the signal indication for the adjacent through lane on the same approach as the protected left turn.

C. A steady left-turn YELLOW ARROW signal indication shall be displayed following the left-turn GREEN ARROW signal indication, unless the left-turn GREEN ARROW signal indication and the CIRCULAR GREEN signal indication(s) for the adjacent through movement are being terminated together. When the left-turn GREEN ARROW and CIRCULAR GREEN signal indications are being terminated together, the required display following the left-turn GREEN ARROW signal indication shall be either the display of a CIRCULAR YELLOW signal indication alone or the simultaneous display of the CIRCULAR YELLOW and left-turn YELLOW ARROW signal indications.

D. During the permissive left-turn movement, the shared signal face shall display only a CIRCULAR GREEN signal indication.

E. A protected/permissive shared signal face, regardless of where it is positioned and regardless of how many adjacent through signal faces are provided, shall always simultaneously display the same color of circular indication that the adjacent through signal face or faces display.
Success or Controversy - How to Decide

The main difference between the meanings of circular green and flashing yellow arrow:
- To drivers turning left, circular green and flashing yellow arrow have identical meanings.
- To drivers not turning left, circular green and flashing yellow arrow have very different meanings.
This difference is the reason the flashing yellow arrow signal was created.

The idea that the flashing yellow arrow is to "increase driver understanding" came from layman politicians:
- Driver understanding was included in the studies for a different reason. Since a new indication was needed, all new indications proposed had to be tested for the likelihood of driver misunderstanding. But it was not the main purpose of the research.
- These politicians do not understand the hazard of yellow trap, or the difficulty of providing two-way progression.
- They just wanted something to say, so they could open their mouths and appear to know what's going on.

One case where the flashing yellow arrow is misunderstood:
- Some states used the flashing yellow arrow to replace a green arrow during night flash.
- Drivers who have seen this display expect the flashing yellow arrow to give them a privileged right of way, rather than requiring them to yield to conflicting traffic.

When Flashing Yellow Arrows can not be used:
The Flashing Yellow Arrow shall not be used in these cases:
- On single-lane approaches.
- Where an exclusive lane for the turn controlled by the turn signal does not exist.
- Where any lane is shared between the controlled turn and at least one other traffic movement.
- Where multiple lanes make the controlled turn, and conflicts occur as a result.
- Where the left turn crosses multiple streams of traffic.
- Where multiple permissive turns would otherwise enter the same intersection leg.

DATA

https://midimagic.sgc-hosting.com/fyatruth.htm
Larry Robinson
Using the Data to Make Decisions

- Define KPIs (Key Performance Indicators) Beforehand
  - Ensure all stakeholders KPIs desires are addressed
  - Set realistic expectations about data capabilities
- Collect hypothesis/ideas/biases from key stakeholders on anticipated outcome(s)
- Monitor data collection throughout study to ensure rigor and accuracy in tracking
- Ask key stakeholders if there are any specific analysis or visualizations they would like to see
- Proactively address questions as they come up
Preparing to Analyze the Data

- Data Prep and Cleaning
  - Common unique identifier
  - Level of Detail
  - Consistency
  - “Apples to Apples”
- Organization
  - Storage formatting
  - Recording of nuances
- Tools
  - SQL, Microsoft Excel, Tableau

### Centerville, Indiana

<table>
<thead>
<tr>
<th>Year</th>
<th># of Crashes</th>
<th># of Injuries</th>
<th># of PDO</th>
<th># of Fatalities</th>
<th>Left-Turn Related</th>
<th>Right Angle or Head-On Failure to Yield Right-of-Way</th>
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<tbody>
<tr>
<td>2008</td>
<td>6</td>
<td>3</td>
<td>3</td>
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<td>0</td>
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<tr>
<td>2009</td>
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<td>2012</td>
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<tr>
<td>2013</td>
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<td>1</td>
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<tr>
<td>2014 (through July)</td>
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<td>1</td>
<td>2</td>
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### Monthly Crash and Injury Averages

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<thead>
<tr>
<th>Year</th>
<th># of Crashes</th>
<th>Monthly Crash Average</th>
<th># of Injuries</th>
<th>Monthly Injury Average</th>
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<tbody>
<tr>
<td>2008</td>
<td>6</td>
<td>0.5</td>
<td>3</td>
<td>0.3</td>
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<td>2009</td>
<td>1</td>
<td>0.1</td>
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<td>2010</td>
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<td>0.0</td>
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<td>2011</td>
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<td>0.4</td>
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<tr>
<td>2012</td>
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<td>0.2</td>
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<tr>
<td>2013</td>
<td>6</td>
<td>0.5</td>
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<td>Before Totals</td>
<td>31</td>
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<td>9</td>
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<tr>
<td>2014 (through July)</td>
<td>3</td>
<td>0.5</td>
<td>1</td>
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### Before FYT vs. After FYT

<table>
<thead>
<tr>
<th>Before FYT</th>
<th>Crashes</th>
<th>Injuries</th>
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<tr>
<td>0.431</td>
<td>0.125</td>
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</table>

<table>
<thead>
<tr>
<th>After FYT</th>
<th>Crashes</th>
<th>Injuries</th>
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<tr>
<td>0.500</td>
<td>0.167</td>
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<table>
<thead>
<tr>
<th>% Change</th>
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<tbody>
<tr>
<td>16%</td>
<td>33%</td>
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## Data Visualization

<table>
<thead>
<tr>
<th>Type of Data</th>
<th>Tool for Visualization</th>
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<tbody>
<tr>
<td>Geographic</td>
<td>Tableau</td>
</tr>
<tr>
<td>Everything Else</td>
<td>Excel</td>
</tr>
</tbody>
</table>
Data Visualization Cont’d

- Keep Scales the same on graphs
- Use % Change to show an un-biased view of difference in pre/post values
- Use color like red and green to draw attention to major findings
- Always note time frame and nuances in data
- Be ready for questions

Monthly Averages Calculated based on yearly accident totals divided by months
Time frame before: 2008-2013 Time frame after: Jan-July of 2014
Data from: Joint Transportation Research Program, Indiana Department of Transportation and Purdue University “Evaluation of Flashing Yellow Traffic Signals in Indiana”
Accessed via: https://rosap.ntl.bts.gov/view/dot/29550
Key Findings and Takeaways

- Don’t let the conversation end
  - Have the “What ifs” and “So What” questions and answers
- Discuss follow up research/studies to add to results
  - I.e. survey results
  - Implementing public awareness campaign and re-implementing FYT
- State what you think is obvious
  - After living and working in the data for a long time what may be obvious to you may not be obvious to others
- Put your “consumer” hat on
  - Step out of the analytics role to make sure the results and studies work towards end goals/KPIs
Questions

An Analysis of the Implementation of Flashing Yellow Protective Permissive Signals in Two Cities—Burbank, Ca and Scottsdale, Az
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References: Myburbank.com
City of Burbank, CA Web Page
Citiy-Data.com, city-data.com/city-compare
Flashing Yellow Left Turn Arrows Scottsdale’s Experience
2013 ITE Western District Conference July 16, 2013
Todd Taylor, P.E., PTOE City of Scottsdale Senior Traffic Engineer

Data sourced from US Department of Transportation National Transportation Library at: https://ntl.bts.gov/
Comments on Left Turns

Here is a question that has plagued me for most of my driving life: How far into the intersection should you pull when waiting to make a left-hand turn against oncoming traffic?

How is this an issue?? Are they GIVING away driver’s licenses in boxes of cereal now? You pull into the intersection far enough that a car making a left turn coming the other way can do so in front of your car and vice versa, while also not blocking the lane for cars going straight. Is drivers’ ed dead? Have they stopped making Rules of the Road books? From the Massachusetts Rules of the Road book:

If you are turning left and sitting in the intersection waiting for traffic, do not turn your wheels to the left or even start to turn a little bit, stay complete straight and pointed at the turn signal. Then, if you get hit from behind you’ll be propelled forward instead of into oncoming traffic. Only start to actually turn when it’s clear.

Also, if you are turning left, don’t make unnecessary wide turns where you drift into the lane on your right before turning almost hitting traffic going straight. It’s ridiculous and you should have your license taken away.

Actually I drive through red arrows on the regular if I can see far enough down the road. Never gotten so much as a raised eyebrow from a cop.