Opportunities for Phasing Left Turns across a Multi-Use Path using Flashing Yellow Arrow
FLASHING YELLOW

- allows waiting motorists to make a permitted left-hand turn after yielding
- shown to help drivers make fewer mistakes, making motorists safer during heavy traffic
- reduce delays when traffic is light.
But Did you Know...

Flashing Yellow Arrow operation could have an added benefit for pedestrians as well.
Permitted Left-Turn/ Pedestrian Phase Conflict
Hardwire Conundrum
Left-Turn permissive phase is wired with adjacent through phase.

Left-Turn permissive phase and adjacent through phase are wired separately.
**FLASHING YELLOW OPERATION WITHOUT PEDESTRIAN CALL**

<table>
<thead>
<tr>
<th>PHASE</th>
<th>PEDESTRAIN / BICYCLE SEES:</th>
<th>WEST TO SOUTH TURNING VEHICLE SEES:</th>
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<tr>
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Case Study

Protected-Permitted Left-Turn

Multi-Use Trail Crossing
Insert figure showing unnatural bike crossing direction on trail

Patrick Byrd, 7/5/2016
Case Study Facts

- Multi-use trail users concerned about permissive left-turns across counter flow pedestrian crossing.
- Conflicting left-turn has the following characteristics:
  - Limited storage capacity
  - Operating at LOS E during AM Peak
  - Ample site distance provided
  - 2 not related crashes in 2015
LEADING PROTECTED LEFT DELAYS
FLASHING YELLOW ARROW PHASE

Splits and Phases: 5386: SB On Ramp/SB Off Ramp & Paseo del Norte

- **Flashing Yellow Arrow Not Delayed**
  - W to S Left
  - EB Through
  - WB Through
  - W to S Permitted Portion
  - 42 s
  - 06 (R)
  - 109 s

- **Flashing Yellow Arrow Delayed by Pedestrian Call**
  - W to S Left
  - W to S Flashing Yellow
  - EB Through
  - Pedestrian plus EB Through which postpones “Flashin Yellow Arrow” of Phase 6
  - 42 s
  - 06 (R)
  - 60 s

The start of the permitted Phase cannot be utilized due to EB queue clearance time.
### Average Queue Dispersion of Opposing Through Traffic

<table>
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<th>Peak Hour</th>
<th>50(^{th}) Percentile Opposing Through Queue Clearance (s)</th>
<th>Conflicting Pedestrian Walk Plus Clearance Time (s)</th>
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<tr>
<td>AM</td>
<td>42.8</td>
<td></td>
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<tr>
<td>Midday</td>
<td>28.1</td>
<td>18</td>
</tr>
<tr>
<td>PM</td>
<td>36.3</td>
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Case Study
Implementation Requirements

- Replacement of Left-Turn Signal Heads
- Rewiring of Left-Turn Phase
- Possible Installation of New MMU2 Unit
- Internal Controller Adjustments
  - Logic/Conflict Programming
Key Ideas

- Pedestrian Delayed Flashing Yellow Arrow Phase provide:
  - Protected Pedestrian Phase
    - Except Rights
  - Concurrent Queue Clearance and Ped Phase
  - Breaking the Hardwire Connection provides Phasing and Sequence Flexibility
QUESTIONS?

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Operate during a permissive left-turn phase and increase driver awareness to find appropriate gaps before turning.