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# CDOT Signal Timing Practices – Leading Pedestrian Intervals and Split Phasing with Pedestrian Crossings

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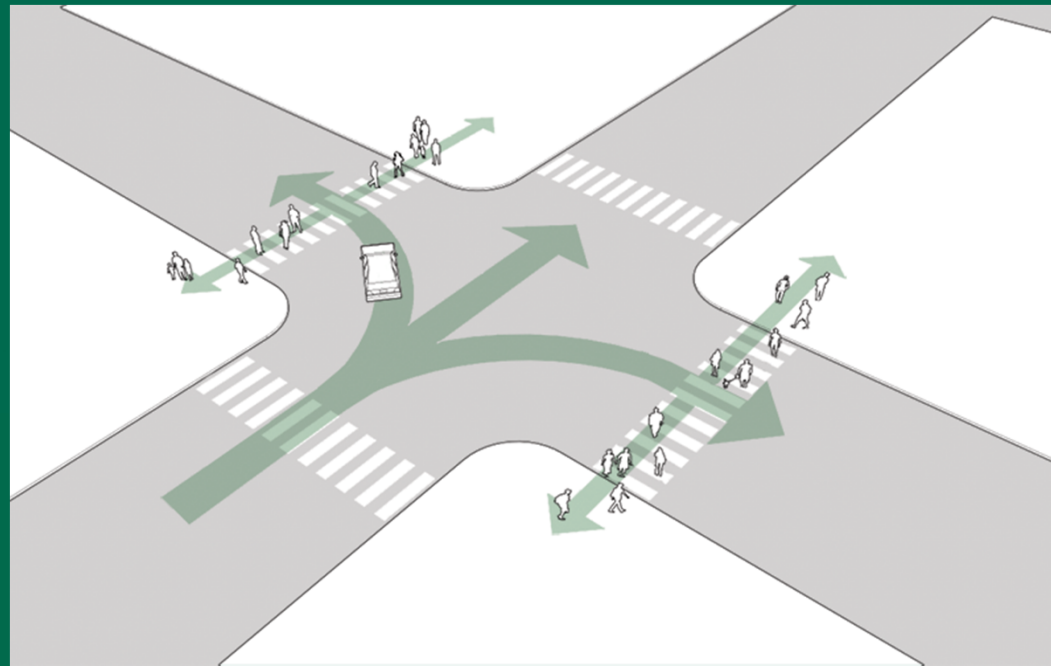


- Leading Pedestrian Intervals (LPIs)
  - Definition
  - History
  - Considerations
  - CBD Deployment
  - CBD Observations
  - CBD Feedback
  - LPI+
- Split Phasing with Pedestrian Crossings
  - Considerations
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## LPI Definition

- The purpose of LPIs is to encourage better driver yielding behavior to pedestrians in crosswalks by making pedestrians more visible and to improve pedestrian safety by reducing pedestrian crashes.



- Pedestrian Impacts:
  - Up to a 60% reduction in pedestrian crashes. (Transportation Research Record No. 2198)
  - Can improve pedestrian “comfort”.
- Vehicle Impacts:
  - Increase in overall delays due to less green time, which varies depending on LPI length and signal cycle lengths.



- First LPI in Charlotte installed over 12 years ago.
- Prior to 2016, LPIs have been installed at 33 intersections.
  - Generally near high schools, where there are pedestrian crash patterns, or where there are heavy right-turn volumes across crosswalks.



## LPI Considerations



- Before installing LPIs, we review the type of pedestrian pushbuttons at the intersection
  - No pushbuttons (Ped Recall)
  - “Traditional” pushbuttons
  - Accessible Pedestrian Signals (APS) pushbuttons



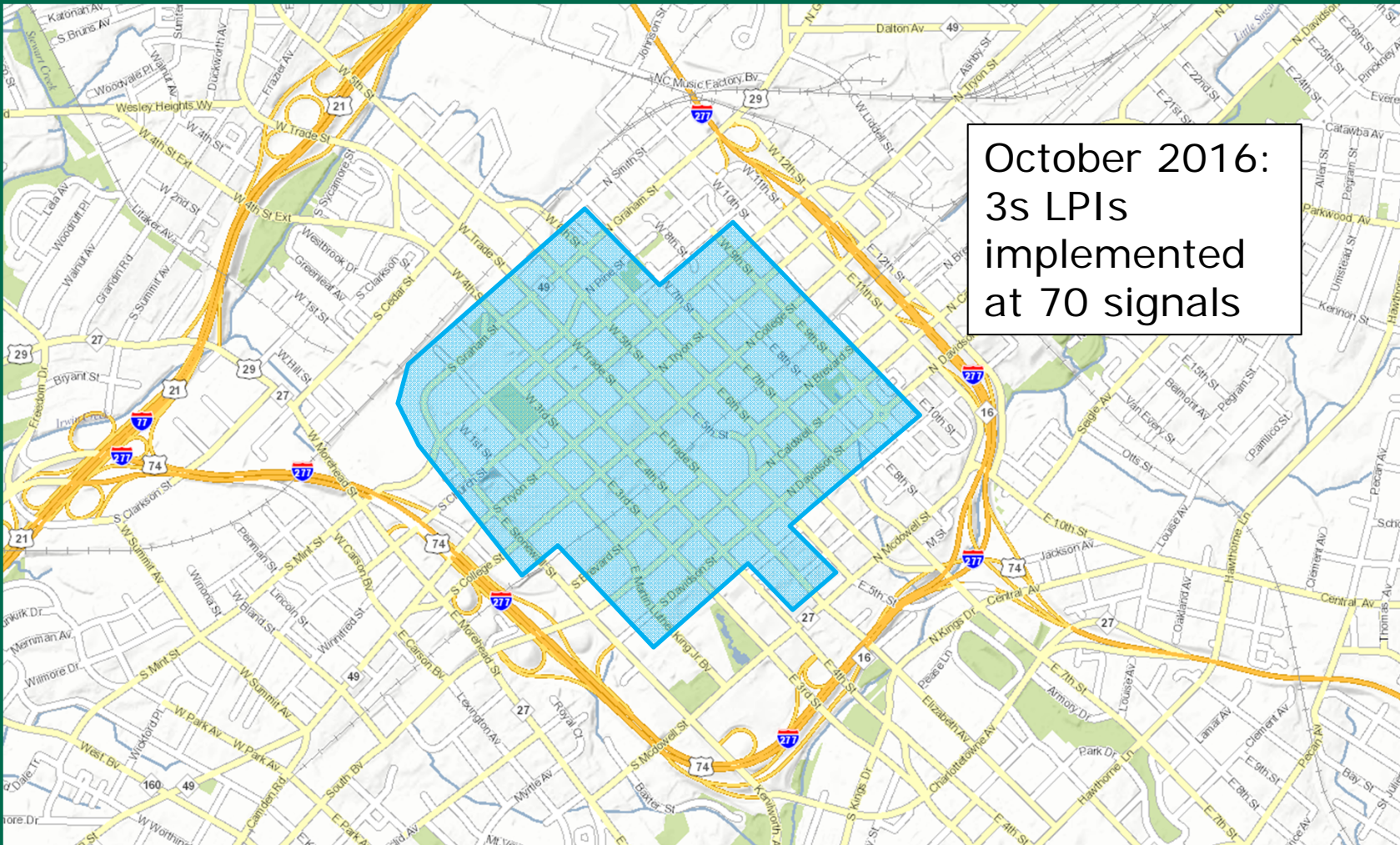


- Intersection Geometry and Lane Uses
  - If there are no vehicle turning movements crossing the crosswalk during its pedestrian phase, then there is no need for a LPI.
- Vehicle and Pedestrian Volumes





# LPI – CBD Deployment







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# LPI – CBD Deployment



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- Initially, some confusion by both drivers and pedestrians with LPIs, but has reduced over time.
- Reduction in vehicle capacity has been negligible, particularly at intersections without turn lanes.
- Too early to determine the effect on pedestrian crashes.

- Almost all feedback has been positive, both internally (within CDOT) and externally. We have received requests from citizens to add LPIs to several signals and corridors inside and outside the CBD that did not previously have LPIs.
- In the CBD, added 8 more intersections on May 4, 2017. Plans in the works to add another 8 more intersections.



- 8 intersections that have LPIs that operate with right turn flashing yellow arrow signals.
  - Longer LPIs, at least 10s
  - APS pushbuttons, right turn lane required
- No Turn on Red (NTOR) signs
  - Blank-out signs (turned on by pedestrian calls)
  - Dual-message blank-out signs
    - NTOR → Right turn yield to pedestrians



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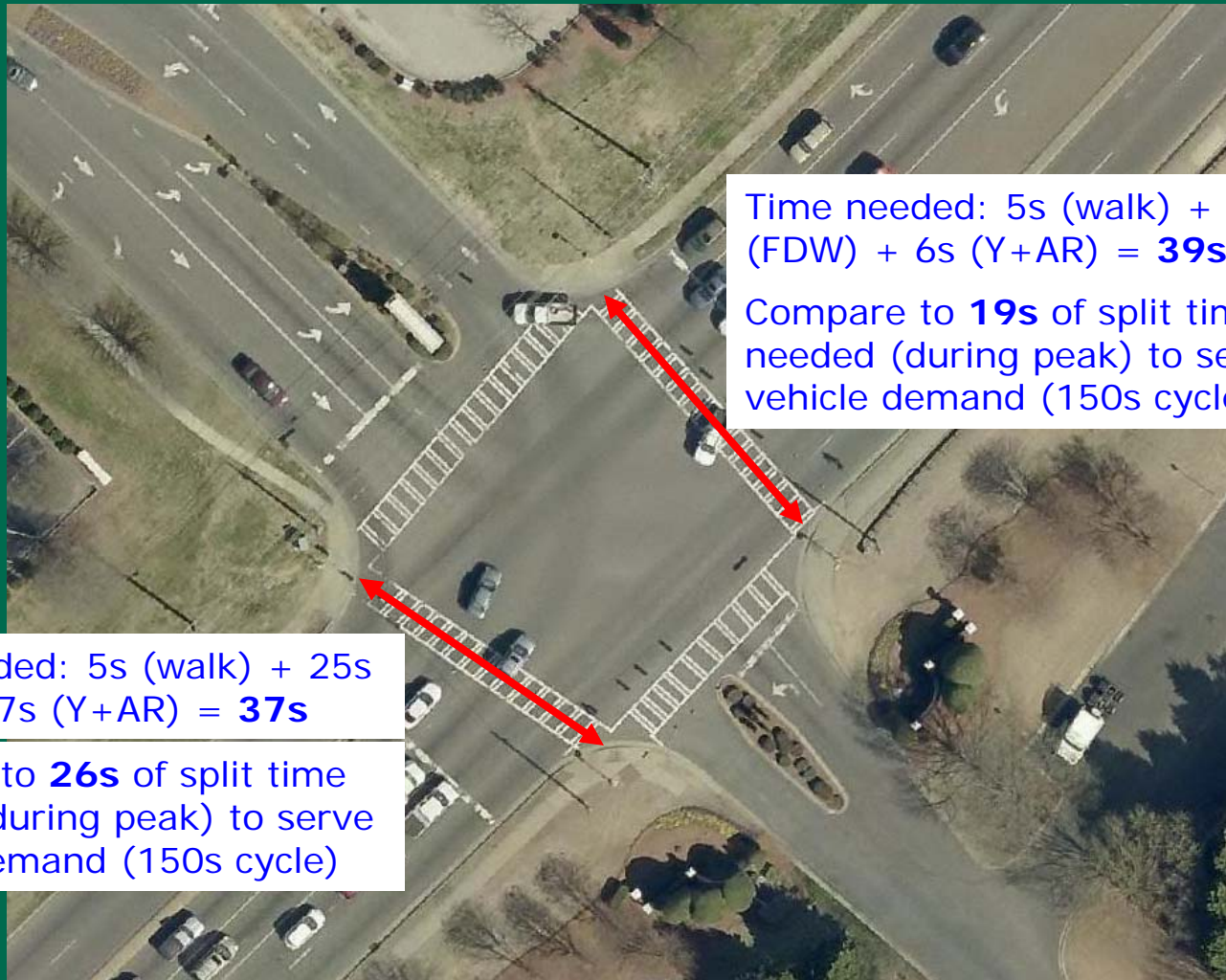
LPI+



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# Ped Crossings with Split Phasing



Time needed: 5s (walk) + 28s (FDW) + 6s (Y+AR) = **39s**

Compare to **19s** of split time needed (during peak) to serve vehicle demand (150s cycle)

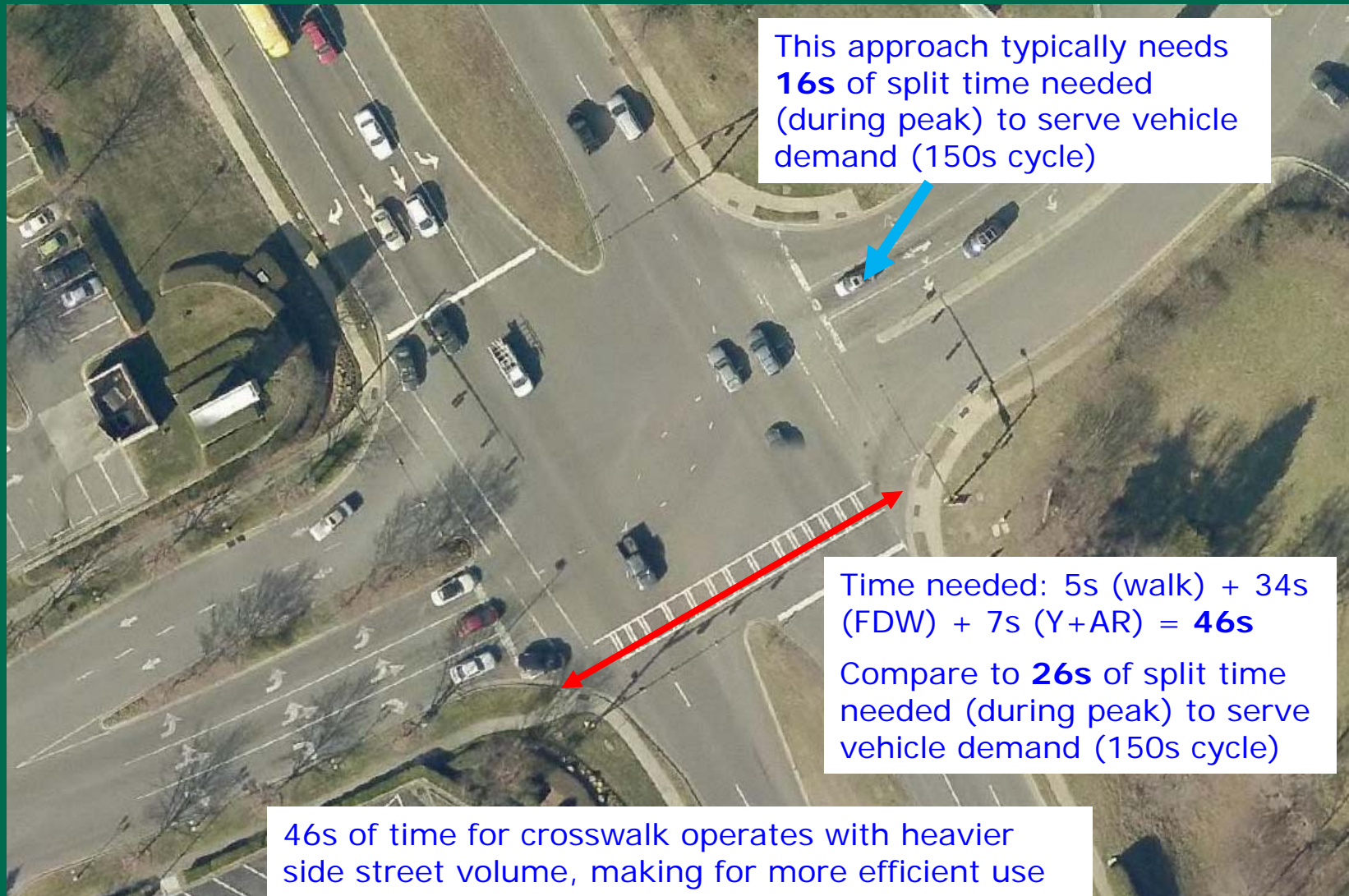
Time needed: 5s (walk) + 25s (FDW) + 7s (Y+AR) = **37s**

Compare to **26s** of split time needed (during peak) to serve vehicle demand (150s cycle)

Needs **76s** (over half) of cycle time if both ped crossings are served



# Ped Crossings with Split Phasing



This approach typically needs **16s** of split time needed (during peak) to serve vehicle demand (150s cycle)

Time needed: 5s (walk) + 34s (FDW) + 7s (Y+AR) = **46s**  
Compare to **26s** of split time needed (during peak) to serve vehicle demand (150s cycle)

46s of time for crosswalk operates with heavier side street volume, making for more efficient use of green time when there is pedestrian demand.



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Questions?

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