Briefing on a Survey on Traffic Signal Timing in the Washington Region

Item #11

DRAFT

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Background

- TPB requested a regional traffic signal optimization status report at the February 20 meeting
  - Identified as CLRP priority area
- Follows from the 2002-2005 signal optimization Transportation Emissions Reduction Measure (TERM)
- Periodic updates document ongoing regional practices

What Does It Mean for Signals to Be Optimized?

- Traffic signals re-timed for optimal performance, considering
  - traffic loads
  - cross traffic, left and right turns
  - pedestrians
- Coordination of multiple signals (e.g., downtown areas, corridors)
- Engineering rule-of-thumb: re-time every 3 years

Optimized Does Not Always Mean Minimal Delay for an Individual Motorist

- If there are high traffic volumes / left and right turns / high cross-traffic volumes
- If you are traveling in the opposite direction of predominant flow
- Ensuring the safety of and sufficient crossing time for pedestrians

How Do We Know that Signals are Optimized?

- Engineers do not rely solely on the "raw" computer output
- Before and after field observations help verify that the optimization process has been successful
- Ongoing field observations and monitoring from the traffic control center are important, with fine-tuning if necessary
- These monitoring and spot checks activities, as well as responding to citizen inquiries and complaints, all help ensure the system remains working properly

Traffic Signals in Real Time

- Improved technologies make it easier for engineering staff to monitor traffic flow and make real-time adjustments
- Computer algorithms and technicians monitoring traffic can detect upstream conditions and anticipate signal timing adjustments to minimize delay
- Particularly effective in addressing non-recurring congestion caused by incidents and special events

TERM Context of Signal Timing/ Optimization: Then and Now

- In 2002, the regional Signal Optimization TERM offered a way to close a gap between the projected air quality performance/ conformity of the CLRP and what was required
- In the years since, the air quality analysis context has changed:
  - Previous optimization achievements are now in the "baseline" conditions of CLRP air quality analysis and cannot be re-counted
  - There is no current gap to be filled between CLRP performance and target conformity requirements
  - Today's EPA-mandated analysis methodology does not readily accommodate TERMs of this type ("MOVES" model vs. "Mobil" model)
  - Today's cleaner-running cars reduce air quality benefits of projects of this type
- Nevertheless, though the air quality conformity motivation for optimization may have been reduced, there are still congestion management and other reasons to continue optimization efforts

Survey

- TPB staff surveyed transportation agencies in April 2013
- 21 different agencies have ownership and/or maintenance responsibility for traffic signals in the Washington region
  - Not including military facilities/bases, excluded from the survey since their roads are not open to the public
- Survey focused on whether signals were optimized or checked within calendar years 2009-2012
  - Follows the 3-year engineering rule-of-thumb
- Responses reflect approximately 98% of all signals in the region that are subject to optimization
  - Signals not subject to optimization were not included in the survey (e.g., firehouse emergency signals, pedestrian crosswalk flashers)

Timing/Optimization Methods

- **A signal was counted as re-timed/optimized if one or more of the following methods was utilized during the three-year 2009-2012 reporting period:**
  - **Computer optimized**: Use of software packages and detailed input data to pre-determine recommended timing plans
  - **Engineering Judgment**: Field-based observation by traffic engineers to verify timing
  - **Active Management**: Observation and adjustment of specially-equipped signals from a central control center by engineering staff, on a real-time basis, responding to quickly-changing traffic conditions
- **Not checked**: If none of the above methods were used in the three-year period for a given signal
- **No report**: For signals documented on regional lists but for which no report was received in this time frame

Timing Results (2009-2012)

- Approximate total signals in region: **5,500**
- Total optimized, checked, or adjusted in the three-year period: **76%**
  - Computer optimized: **47%**
  - Engineering Judgment: **7%**
  - Active Management: **22%**
- Not checked: **22%**
- No report: **2%**

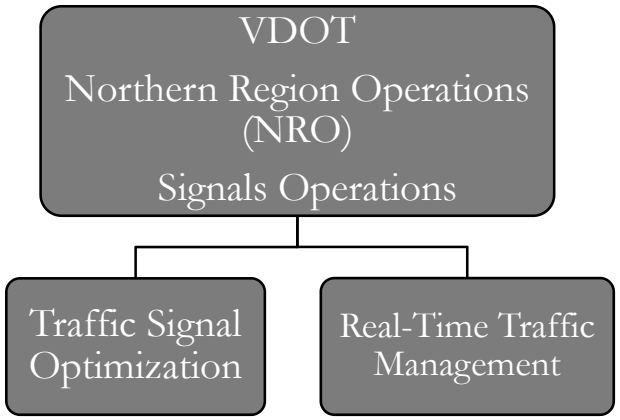
How is the Region Doing on Optimization Compared to 2009?

- Regional results overall held to a similar albeit lower level than three years ago (76% vs. 80%)
  - Regional results, though lower, perhaps better than expected due to this having been an especially difficult "belt-tightening" period for state and local agencies
  - Regional total of 4,200 optimized/timed signals compares favorably to the original TERM target of 2,946
- DDOT currently has a five-year signal re-timing project that will boost the regional average as of 2013
- The proliferation of advanced signal control technology has allowed agencies to improve traffic flow beyond what is possible with computerized pre-timed optimization methods alone

Outlook

- Continuing awareness of and commitment to safe and effective signals operations
- Effective interagency coordination through the Traffic Signals Subcommittee and other forums
- The benefits of providing sufficient resources to ensure good signals operations are widely recognized

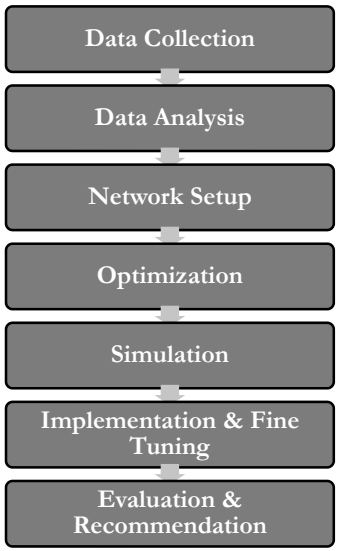
Example: VDOT



Traffic Signal Optimization

- Nearly 1,350 Signals
- 21 Networks
- 3 Counties - Fairfax, Loudoun and Prince William Counties.
- 8 Timing Plans
  - AM Peak, PM Peak, Midday Peak, Off-Peak, Weekend AM, Weekend PM, Saturday Peak and Sunday Peak.
- Special Timing Plans
  - Holiday Plans, 4th of July Plans, and other event plans

Traffic Signal Optimization Process



Traffic Signal Optimization Benefits

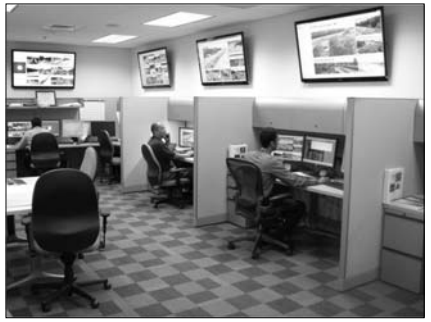
- Economic Benefits
  - Stop, Delay and Fuel Consumption
  - Benefit to Cost Ratio – 49:1 (Fourth Round)
  - Overall Savings - $97,742,104 (Fourth Round)
- Environmental Benefits
  - Annual Emission Reductions of 555.24 metric tons (Fourth Round)
- Travel Time and Level of Service Improvements
- Update of Pedestrian and Vehicular Clearance times based on the latest MUTCD and VDOT guidelines
- Digital Library
- Operational and Geometric Recommendations

Real-Time Traffic Management

- Manage nearly 1,350 traffic signals.
- Implement real time signal timing changes in response to incidents, congestion, work zones, weather events, special events and emergency conditions.
- Coordinate with TOC (Transportation Operation Center) and local agencies during incidents.
- Monitor the performance of arterials using CCTV's, VICADS and MIST Central Signal System.
- Maintain the health of the arterial signal network system.

Real-Time Traffic Management

- **CCTV Cameras – 111 cameras**
- **SOC Hours**
  Monday to Friday: 5:00 am to 9:00 pm
  Saturday and Sunday: 9:30 am to 6:00 pm
- **Coverage during major events**
- **Staff on call to handle emergency situations**



Signal Operations Center (SOC)