

## **ITEM 13 - Information**

December 17, 2003

### **Progress Report on Regional Traffic Signal Optimization Transportation Emissions Reduction Measure (TERM)**

#### **Staff**

**Recommendation:** Receive briefing on the regional traffic signal optimization program, which is ahead of schedule in progressing toward the goals set in the TERM.

**Issues:** None

**Background:** The Board adopted the traffic signal optimization TERM on July 31, 2002. It committed to examining and adjusting the timing and coordination of an additional 856 signalized intersections in the region by 2005. The program aims to reduce emissions, improve traffic safety, mitigate traffic congestion, and address pedestrian safety and transit access. Results to date indicate that the region will exceed the adopted goal of 856 newly optimized intersections.

To support this program, DDOT, MDOT, VDOT, and several local jurisdictions supplemented and enhanced their on-going signal optimization efforts. The Traffic Signals Working Group of the TPB's Management, Operations, and Intelligent Transportation Systems (MOITS) Policy and Technical Task Forces has helped coordinate these efforts.



District of Columbia  
 Bowie  
 College Park  
 Frederick County  
 Gaithersburg  
 Greenbelt  
 Montgomery County  
 Prince George's County  
 Rockville  
 Takoma Park  
 Alexandria  
 Arlington County  
 Fairfax  
 Fairfax County  
 Falls Church  
 Loudoun County  
 Manassas  
 Prince William County

**MEMORANDUM**

**TO:** Transportation Planning Board

**FROM:** Ronald F. Kirby  
 Director, Department of  
 Transportation Planning

**DATE:** December 10, 2003

**SUBJECT:** Meeting the Goals of the Traffic Signal Optimization  
 Transportation Emissions Reduction Measure (TERM)

**Background**

At its meeting of July 31, 2002, the Transportation Planning Board adopted a regional signal optimization TERM, which set the goal of the optimization of an additional 856 traffic signals in the region by 2005. The analysis of the cost and emissions benefits for this TERM as adopted July 31, 2002 is included in Attachment A to this memorandum.

The DOTs and the participating local jurisdictions agreed to implement their portions of this TERM in addition to maintaining signals already optimized as of June 2002. The table below shows the status of traffic signal optimization as of June 2002, the number of additional traffic signals to be optimized in the District of Columbia, Suburban Maryland, and Northern Virginia, and an estimate of progress to date.

**Table 1. Signal Optimization TERM Goals and Estimated Progress to Date**

Jurisdiction	Number of Signalized Intersections as of June, 2002	Number Optimized pre-TERM as of June, 2002*	TERM Commitment by 2005	Base + Commitment Total Goal for TERM by 2005	Progress to Date Base + Commitment (Prelim. Est.)
DC	1390	153	344	497	553
Suburban MD	1509	702	240	942	884
Northern VA	1641	1231	272	1503	1231
Total	4540	2086	856	2942	2668

\* Optimized within three years prior to June, 2002

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Based on the initial reports from the DOTs, the region is well on its way to fulfilling, and probably exceeding, the TERM commitment of 856 signals by 2005. The status of each jurisdiction's optimization program is summarized below.

#### District of Columbia

The District of Columbia committed to optimizing 344 traffic signals. As of September 8, 2003, DDOT had optimized 400 intersections in the Central Business District, and plans to optimize all its remaining signals in 2004. If all these signals are optimized by June of 2005, the District will exceed its commitment by 800 signals. The District of Columbia has made great progress recently. According to current estimates, the District of Columbia has improved from having approximately 11% of its signals optimized to having about 40% recently optimized.

#### Suburban Maryland

Suburban Maryland jurisdictions are also on track to meet or exceed the commitment of 240 signals. MDOT has optimized all the signals under its control, which includes 182 signals not optimized as of June 2002, and is working with Montgomery County to optimize an additional 225 signals under county control. Montgomery County has obtained the same SYNCHRO software that MDOT uses. This will allow Montgomery County to report its optimization results in the same format as MDOT, Prince George's County, and the rest of the region, and will help ensure appropriate TERM credit for Montgomery County's extensive traffic management efforts. According to current estimates, Suburban Maryland jurisdictions have improved from about 46% of signals optimized to an estimated 58% optimized.

#### Northern Virginia

Based on current plans, Northern Virginia jurisdictions will meet the TERM commitment of at least 272 signals by June 2005. Since all of VDOT's signalized intersections were already optimized prior to the TERM adoption, all additional efforts have concentrated on signals operated by the local jurisdictions. While VDOT has committed CMAQ funds to help participating local jurisdictions optimize their signals, their disbursement awaits availability of federal FY 2004 funds. These optimization programs will get started in earnest when these funds become available, perhaps by March 2004, though some preliminary work is currently underway. According to current estimates, about 75% of Northern Virginia's signals have been optimized to date. When the 272 local jurisdiction signals are optimized by 2005, almost 92 % of the Northern Virginia signals will have been optimized.

## Regional Signal Optimization Program

**Description:** This regional signal optimization program is being created by State and local governments in the region. This program will include the synchronization and optimization of 856 signals around the region which will be optimized and maintained through 2005. The region will obtain emission benefits due to reduced stop and starts (improved average running speeds) and reduced idling time at signals.

**Analysis Tool:** Sketch Planning and Synchro model

### Assumptions:

The methodology used in this analysis uses studies prepared by the District of Columbia Division of Transportation for the 16<sup>th</sup> Street corridor from Eastern Avenue, NW to P Street NW, and by Maryland State Highway Administration for MD 650 (New Hampshire Avenue) from MD 212 to Peabody Street in the District. Delay reductions and operating speed improvements were obtained from the Synchro model. Emission factors were obtained from the Mobile5 model, using 1999 vehicle registration and VMT information.

### Emission Analysis:

Corridor 16<sup>th</sup> Street NW

Number of Signals: 38

Posted Speed Limit: 30 mph

Distance: 5.8 miles

Pre Optimization -> average speed : AM 8.3 mph

Post Optimization -> average speed: AM 13.5 mph

**Improvement: AM 5.2 mph**

Pre Optimization -> average speed: PM 13.7 mph

Post Optimization -> average speed: PM 16.3 mph

**Improvement: PM 2.6 mph**

AM Peak period volume: 2,000 vehicles/hr x 3 hours = 6,000 vehicles

AM Peak period VMT: 6,000 x 5.8 miles = 34,800 VMT

PM Peak period volume: 1,800 vehicles/hr x 3 hours = 5,400 vehicles

PM Peak period VMT: 5,400 x 5.8 miles = 31,320 VMT

### AM Emissions

$$\text{Pre-Opt. } 34,800 \times 1.073 \text{ grams/mile} = 37,340 \text{ grams}$$

$$\text{Post Opt. } 34,800 \times 0.980 \text{ grams/mile} = 34,104 \text{ grams}$$

**Savings : 3,236 grams**

### PM Emissions :

$$\text{Pre-Opt. } 31320 \times 0.98 \text{ grams/mile} = 30,694 \text{ grams}$$

$$\text{Post Opt. } 31320 \times 0.962 \text{ grams/mile} = 30,130 \text{ grams}$$

**Savings : 564 grams**

Total Daily Emissions:

Based on traffic count data 42% of daily traffic occurs during the AM and PM peak period.  
Savings achieved over a 24 hour period  $(3236+564) \times 100/42 = 9,048$  grams

Daily savings in tons/day:  $9,048 \text{ grams} / 907,185 = \underline{\underline{0.0099 \text{ tons/day}}}$

Corridor : MD 650

Length = 4.3 miles

Number of Signals = 26

AM Peak Period Volume = 8,800

PM Peak Period Volume = 10,350

AM average speed improvement = 5 mph

PM average speed improvement = 2 mph

AM emissions saving =  $8,800 \text{ vehicles} \times 4.3 \text{ miles} \times 0.078 \text{ grams/mile} = 2951 \text{ grams}$

PM emissions saving =  $10,350 \text{ vehicles} \times 4.3 \text{ miles} \times 0.014 \text{ grams/mile} = 623 \text{ grams}$

Daily Savings =  $(2951 + 623) \times 100/42 = 8510 \text{ grams}$  or **0.0094 tons/day**

**Regional Impact**

Using the results of the two analyses one for a 38-signal corridor and the other for a 26-signal corridor we are estimating the benefits of a regional program.

Average NOx emissions benefit per signal based on D.C. study	0.00026	tons/day
Average NOx emissions benefit per signal based on the MD study	0.0003	tons/day
Regional average NOx emissions benefit per signal	0.00028	tons/day
Total number of signals to be optimized by 2005 in VA	272	
NOx emissions benefit = (136 x 0.00028)/2+(136 x 0.00028)	=0.0571	tons/day
Total number of signals to be optimized by 2005 in MD	=240	
NOx emissions benefit = (120 x 0.00028)/2+(120 x 0.00028)	=0.0504	tons/day
Total number of signals to be optimized by 2005 in DC	=344	
NOx emissions benefit = (172 x 0.00028)/2+(172 x 0.00028)	=0.0722	tons/day
Total number of signals to be optimized by 2005 regionally	=846	
<b>Total NOx emissions benefit by 2005</b>	<b>=0.1797</b>	<b>tons/day</b>

**Cost effectiveness:**

Cost of signal optimization per signal: \$3500  
 Total cost of signal optimization VA: \$3500 x 272 = \$ 952,000  
 Total cost of signal optimization MD: \$3500 x 240 = \$ 840,000  
 Total cost of signal optimization DC: \$3500 x 344 = \$ 1,204,000

Total cost of signal optimization (FY 2004-2005): (272 + 240 + 344) x \$3500 = \$ 2,996,000

Cost effectiveness: 
$$\frac{\$2,996,000}{250 \text{ days} \times 0.1797 \text{ tons/day}} = \$ 66,700 /\text{ton}$$

**Summary Table**

Cost and NOx emissions benefits

<b>State</b>	<b>Total Cost (2003-2005)</b>	<b>2005 Emissions Benefit (tons/day)</b>
Virginia	\$952,000	0.0571
Maryland	\$840,000	0.0504
District of Columbia	\$1,204,000	0.0722
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<b>Regional Total</b>	<b>\$2,996,000</b>	<b>0.1797</b>