Memorandum

July 21, 2009

To: Travel Management Subcommittee

From: Daivamani Sivasailam
            Eulalie Lucas
            Department of Transportation Planning

Subject: Activities Associated With the MOVES Model

Staff is testing the MOVES model using national default input data as well as local data where possible, and will report on initial results in the coming months.

On June 29th and 30th COG hosted a MOVES training conducted jointly by US EPA and FHWA. The hands on training in the use of MOVES model was attended by TPB staff as well as FHWA, state DOT, DEP and consultants.

Attachment A is an email from Mike Clifford to EPA with a number of questions related to testing and implementation of the MOVES model in our region.

A joint TPB Tech/MWAQC TAC Task Force with Jim Ponticello, VDOT and Diane Franks, MDE as the co-chairs is being formed; the first meeting of the Task Force is scheduled to take place at 10 AM on August 18, 2009 in the COG offices. The Task Force will review selected local inputs to the MOVES model, review the current mobile source emissions inventory process, and recommend an overall approach based on the MOVES model capabilities and EPA Technical Guidance as it is received. Attachment B is a sample of the MOVES model inputs with descriptions.

Attachments A & B

From: Mike Clifford
Sent: Friday, July 10, 2009 8:58 AM
To: 'Brzezinski.David@epamail.epa.gov'
Subject: MOVES questions

Dave,

At last week's MOVES training session held in our offices at the Washington Council of Governments in Washington, DC, I had a number of questions about the approach we might adopt in transitioning from Mobile6. I posed a couple of them to Megan, but she thought they might be better addressed via email rather than in the discussion period at the training.

Since the early 1980s, due to our need to evaluate different control strategies, we have had a fairly disaggregate mobile source emissions modeling process here (detailed documentation of our most recent air quality conformity assessment, for example, is posted on our website at: www.mwcog.org). Our mobile source emissions inventories for SIP and conformity planning consist of emissions: (1) by trip cycle, i.e., we report separate estimates of start (based on trip origin data), running (VMT based), soak (trip destination based), and diurnal and resting loss (based upon numbers of gasoline fueled vehicles); (2) for separate components of travel demand, i.e., (a.) 'network-based' emissions, which account for the lion's share of each pollutant; supplemented by (b.) 'off-network' emissions, which are based upon local road traffic from HPMS estimates of travel in DC, MD and VA; (c.) school bus emissions, based upon VMT and operating speeds obtained from the school districts in each jurisdiction; (d.) transit bus emissions, similarly based upon VMT and operating speed data provided by all of the transit operators in the Washington area, and (e.) 'auto access to transit' emissions, i.e., vehicles which are used in driving to transit stations or park and ride lots, but which are not loaded onto our highway networks.

We prepare our emissions inventories by executing the Mobile6 model with separate VMT mixes for network (HPMS %'s), off-network (based upon extensive local count data, which show lower heavy truck %'s on local roads), school bus (100% school bus VMT), transit (100% transit bus VMT), and auto access (reflecting commuter vehicles, i.e., passenger cars and light duty trucks only). We prepare separate emissions rates in 1 mph increments for each of the 12 major jurisdictions in the Washington region, using city or county-specific vehicle age distribution, diesel fractions, and state-specific fuel and I/M programs. We then summarize our travel demand model data to align with these categories and we apply the emissions rates to the travel demand data in an emissions post-processor for each hour of the day. We also use trip table data to reflect the inter-jurisdictional nature of travel in the metro area before applying the rates. For example, using DC to illustrate, emissions rates applied to VMT in DC are not only DC's rates, but reflect the emissions rates of each jurisdiction in the region in the proportion that it contributes to DC's total VMT.

The fundamental question we have been trying to address here at COG is how to structure our analysis approach to transition to MOVES, i.e., whether we can preserve any or all of these separate components of our analysis or whether it's time to simplify our procedures. Should we even preserve our post-processor approach or switch to MOVES for the emissions calculations?

Much of the focus of the training session, of course, was on how MOVES is executed, how much better the vehicle test data are within the model, and how the drive cycles are more realistic. But, I feel like we need some guidance on how we might structure our analysis approach before we can even adequately test the model. For example, should we run it once for each county, get separate 'emissions rates', and then apply them to separate travel estimates in each county the way we do now, or develop a 'regional average vehicle' using metro averages for vehicle ages,

dsf, fuel and I/M programs, and let MOVES calculate emissions? Are these other stratifications desirable or even possible?

I realize you all are working on the technical guidance documents which may answer some of these questions, but any assistance you can provide now would be appreciated. I'm at 202 962 3312 if you have any questions or would like to discuss any of this. Thanks.

Mike

Attachment B

MOVES Database Inputs	Description
Base Year vehicle population	Total number of vehicles by 13 MOVES vehicle types. See page B-2
Base year VMT	From 1999 FHWA Database Requires Annual VMT by HPMS six vehicle classes
Road Type Vehicle Fractions	FHWA Facility Types and MOVES Vehicle types by hour See page B-3 Guidance needed to distinguish long haul and short haul truck VMT. Needed by hour, day and month and urban /rural split
Mileage Accumulation Rates	MOBILE6
Fleet age distribution	Yes need 30 years distribution
Average Speed Distribution	Needed by hour, day and road type. Can use MOBILE6 values
Driving Schedules	Needed by vehicle type, roadway type and average speed.
Facility Types	Need HPMS road type Five Types Urban/Rural Split
Fuel Types	Nine types .See Page B-4
IM Coverage	Same as MOBILE
Vehicle Hours of Operation	Needed by hour and county. Based on VMT and average speed
Vehicle Types	See Table 1
Starts by vehicle type	Based on trips-per-day from instrumented vehicles and daily VMT allocation.
Extended Idle Hours	Need truck stop survey data
SCC Road Type	Available
Average Tank Temperature	Default

On-Road Vehicle Types

HPMS Vehicle Type	MOVES VehicleType
Motorcycles	Motorcycles
Passenger Cars	Passenger Cars
Other 4-tire/2-axle	Passenger Trucks
	Light Commercial Trucks
Buses	Inter-city Buses
	Transit Buses
	School Buses
Single Unit Trucks	Refuse Trucks
	Single Unit Short-haul
	Single Unit Long-haul
	Motor Homes
Combination Trucks	Combination Short-haul
	Combination Long-haul

Attachment B

MOVES Vehicle TypeID	Description
1	Off Network
11	Rural Interstate
13	Rural Other Principal Arterial
15	Rural Minor Arterial
17	Rural Major Collector
19	Rural Minor Collector
21	Rural Local
23	Urban Interstate
25	Urban Other Freeways and Expressway
27	Urban Other Principal Arterial
29	Urban Minor Arterial
31	Urban Collector
33	Urban Local

For each vehicle Type, a MOVES RoadType VMTFraction is needed by hour of day.

Attachment B

Fuel Type	Fuel Sub Types	Number of Fuel Formulations
Gasoline	CG, RFG, E10	146
Diesel	Diesel, Biodiesel, FT	69
CNG	CNG	1
LPG	LPG	1
E85	E85	1
M85	M85	1
H2 Gas	H2 Gas	1
H2 Liquid	H2 Liquid	1
Electricity	Electricity	1

Fuel Type
–The broadest category, considered a fixed characteristic of a vehicle.

Fuel Subtype
–A subcategory of Fuel Type.

Fuel Formulation
–A specific fuel with specific properties.
–Each Fuel Formulation belongs to a Fuel Subtype.

Fuel Adjustment
–A multiplicative factor applied to emission results.
–Each Fuel Formulation has a set of Fuel Adjustments.

Fuel Supply
–A mapping of Fuel Formulations to county, month & year.

Example of a Fuel Formulation ID 1126
–RFG with RVP = 6.9 psi, Sulfur = 120 ppm, 11% MTBE.