

Attachment A: Proposed New Approach for Estimating Heavy-duty Source Mass

As described in Section 15 of the *Population and Activity of On-road Vehicles in MOVES201X* report, source mass is one of the factors used in MOVES to determine vehicle specific power (VSP) and scaled tractive power (STP), which are determinants in selecting appropriate operating modes and, in turn, emission rates. MOVES201X includes an added capability to vary source masses by regulatory class and source type; however, the updates to source mass as currently described in the Population and Activity report only adjust source mass by source type and model year. While this is consistent with the treatment of source mass by MOVES2014, there may be instances where average source mass is not representative of a regulatory class. For example, the average source mass for a MY2011 refuse truck is approximately 51,000 lbs. Under the current framework, this average mass will be used for calculating STP bins for refuse trucks in all regulatory classes, including 42, which represents trucks between 14,000 and 19,500 lbs. Therefore, we are considering updating source masses to vary by source type and regulatory class.

The primary data source for this update will be weigh-in-motion data collected by FHWA's Vehicle Travel Information System (VTRIS).¹ Average vehicle masses are available by HPMS vehicle class (single-unit or combination truck), number of axles, state, and calendar year. While number of axles is not a perfect surrogate for regulatory class, a preliminary examination of a subset of the data suggests that it allows an approximation to light-heavy-duty, medium-heavy-duty, and heavy-heavy-duty truck categories. Table 1, below, shows how we would map HPMS class and axle categories to MOVES source types and regulatory classes. A national average would be calculated by VMT-weighting each state's average masses using state VMT data from FHWA's *Highway Statistics* table VM-2.² We would use calendar year 2013 as the basis for all model years. This is because the first phase of the Heavy-Duty Greenhouse Gas rule was expected to impact combination truck mass and was implemented beginning in 2014. The expected changes to truck masses due to both phases of the rulemaking for model years 2014 and later will be applied to the calendar year 2013 data.

Regarding the mappings given in Table 1, when multiple FHWA Vehicle Classes are listed for a given source type and regulatory class, vehicle counts will be used to calculate a weighted average gross vehicle mass. Lacking a better data source or methodology, the average for all trucks will be used for determining bus weights in each applicable regulatory class. This methodology is similar to the analysis for projecting bus VMT and population as described in Sections 3 and 4 of the Population and Activity report.

In addition to updating the source mass, we are also considering updating the fixed mass factors. Since the fixed mass factors are used in the derivation of emission rates and are not dependent on vehicle population or activity, that update is discussed in the Heavy-Duty Emissions report and is being peer-reviewed separately.

¹ <https://fhwaapps.fhwa.dot.gov/vtris-wp/default.aspx>

² <https://www.fhwa.dot.gov/policyinformation/statistics/2014/vm2.cfm>

Table 1 Mapping FHWA Vehicle Class in VTRIS to MOVES Source Types and Regulatory Classes

Source Type (sourceTypeID)	Regulatory Class (regClassID)	FHWA Vehicle Class
Other Bus (41)	LHD45 (42)	Single-unit Trucks: 2-axle 6-tire
	MHD (46)	Single-unit Trucks: 3-axle Single Trailer Trucks: 4-axles or less
	HHD (47)	Single-unit Trucks: 4-axle or more Single Trailer Trucks: 5-axle, 6-axle or more All Multi-Trailer Trucks
Transit Bus (42)	LHD45 (42)	Single-unit Trucks: 2-axle 6-tire
	MHD (46)	Single-unit Trucks: 3-axle Single Trailer Trucks: 4-axles or less
	HHD (47)	Single-unit Trucks: 4-axle or more Single Trailer Trucks: 5-axle, 6-axle or more All Multi-Trailer Trucks
	Urban Bus (48)	Single-unit Trucks: 4-axle or more Single Trailer Trucks: 5-axle, 6-axle or more All Multi-Trailer Trucks
School Bus (43)	LHD≤14k (41)	Single-unit Trucks: 2-axle 6-tire
	LHD45 (42)	Single-unit Trucks: 2-axle 6-tire
	MHD (46)	Single-unit Trucks: 3-axle Single Trailer Trucks: 4-axles or less
	HHD (47)	Single-unit Trucks: 4-axle or more Single Trailer Trucks: 5-axle, 6-axle or more All Multi-Trailer Trucks
Refuse Truck (51)	LHD≤14k (41)	Single-unit Trucks: 2-axle 6-tire
	LHD45 (42)	Single-unit Trucks: 2-axle 6-tire
	MHD (46)	Single-unit Trucks: 3-axle
	HHD (47)	Single-unit Trucks: 4-axle or more
Single-unit Short-haul Truck (52)	LHD≤14k (41)	Single-unit Trucks: 2-axle 6-tire
	LHD45 (42)	Single-unit Trucks: 2-axle 6-tire
	MHD (46)	Single-unit Trucks: 3-axle
	HHD (47)	Single-unit Trucks: 4-axle or more
Single-unit Long-haul Truck (53)	LHD≤14k (41)	Single-unit Trucks: 2-axle 6-tire
	LHD45 (42)	Single-unit Trucks: 2-axle 6-tire
	MHD (46)	Single-unit Trucks: 3-axle
	HHD (47)	Single-unit Trucks: 4-axle or more
Motor Home (54)	LHD≤14k (41)	Single-unit Trucks: 2-axle 6-tire
	LHD45 (42)	Single-unit Trucks: 2-axle 6-tire
	MHD (46)	Single-unit Trucks: 3-axle
	HHD (47)	Single-unit Trucks: 4-axle or more
Combination Short-haul Truck (61)	MHD (46)	Single Trailer Trucks: 4-axles or less
	HHD (47)	Single Trailer Trucks: 5-axle, 6-axle or more All Multi-Trailer Trucks
Combination Long-haul Truck (62)	MHD (46)	Single Trailer Trucks: 4-axles or less
	HHD (47)	Single Trailer Trucks: 5-axle, 6-axle or more All Multi-Trailer Trucks