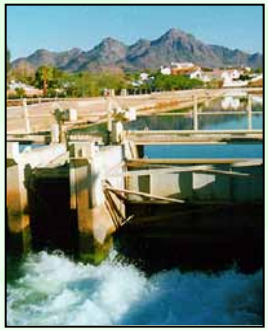
MAG Truck Model and Vehicle Weight Workshop

Use of Vehicle Weights in Calculating PM-10 Emissions

May 18, 2011

MARICOPA ASSOCIATION of GOVERNMENTS

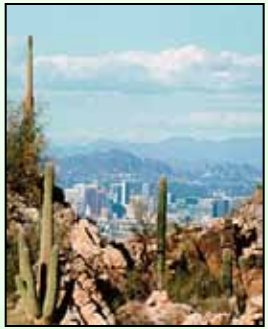
ENVIRONMENTAL PROGRAMS



Why Are PM-10 Emissions Important?

- Maricopa County has been a Serious nonattainment area for particulate (PM-10) air pollution since 1996
- The federal PM-10 standard has proved to be the most difficult for this region to attain
- High concentrations recorded at 18 PM-10 monitors are caused primarily by airborne soil dust
- In 2008, mobile sources contributed about one-half of the annual PM-10 emissions (see pie chart handout)
  - Unpaved roads (24%)
  - Paved roads (14%)
  - Exhaust, tire wear and brake wear (7%)
  - Nonroad sources (aircraft, trains, offroad equipment) (4%)
- Accurate estimation of PM-10 emissions is important to determine what sources need to be controlled to attain the standard

New EPA Paved Road PM-10 Emissions Equation



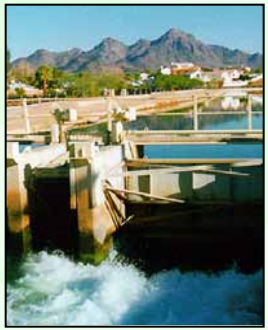
- **One source of PM-10 emissions is vehicles traveling on dusty paved roads**
  - 14% of annual PM-10 emissions
- **A new equation to calculate paved road emissions was released by EPA on 1/13/11:**

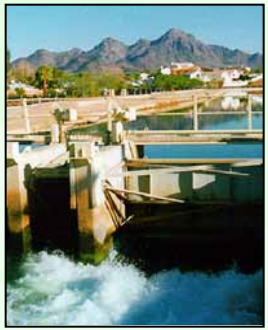
$$E = k(sL)^{0.91} \times W^{1.02}$$

where: E = emission factor in grams per vehicle mile of travel

sL = silt loading in grams per meter squared

W = average vehicle weight in tons

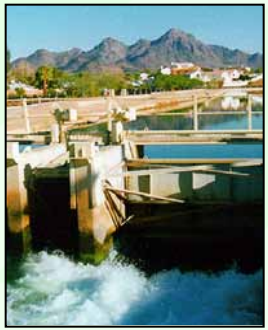




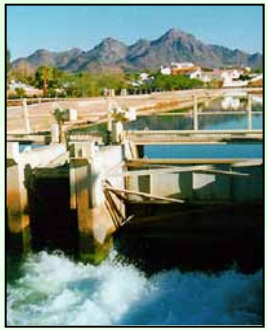
New EPA Paved Road PM-10 Emissions Equation

- **What is the significance of the equation?**
  - The equation is used to calculate paved road PM-10 emissions for air quality plans and conformity analyses in the Maricopa County PM-10 nonattainment area
    - Air quality plans establish transportation conformity budgets
      - Conformity budget for PM-10 includes emissions from exhaust, tire wear, brake wear, unpaved road dust, road construction dust, and paved road dust
    - Conformity analyses demonstrate that the MAG Transportation Improvement Program (TIP) and Regional Transportation Plan conform to the transportation emissions budget
      - Typically performed by MAG several times a year

New EPA Paved Road PM-10 Emissions Equation

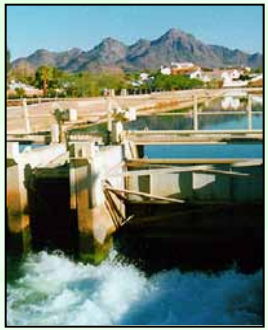


- **The new equation is currently being used:**
  - To update the paved road emissions in the Maricopa County 2008 Periodic Emissions Inventory for PM-10
    - Application of the new equation reduces 2008 paved road emissions in the Maricopa County PM-10 nonattainment area by 61%
  - To develop paved road emissions for the new Five Percent Plan for PM-10 to be submitted to EPA in early 2012
  - To prepare for future transportation conformity analyses



Average Vehicle Weight

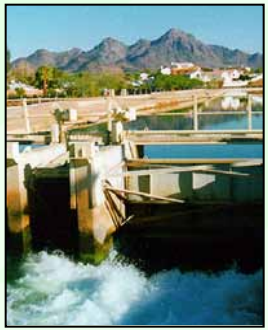
- **Average vehicle weight is an important input to the paved road emissions equation**
  - The Clark County Department of Air Quality and Environmental Management (DAQEM) developed a methodology to estimate average vehicle weight for use in demonstrating conformity to the PM-10 budget
    - Report - “Average Vehicle Fleet Weight in Clark County, Nevada,” February 2006
    - Uses National Highway Traffic Safety Administration (NHTSA) weights for light duty vehicles & maximum gross vehicle weight (GVW) for medium and heavy vehicles (Class 2-8)
  - Using this methodology, DAQEM estimated the average vehicle weight in Clark County to be 2.25 tons



Average Vehicle Weight Calculation

Truck Weight Class	GVW (lbs)
Class 2	8,501-10,000
Class 3	10,001-14,000
Class 4	14,001-16,000
Class 5	16,001-19,500
Class 6	19,501-26,000
Class 7	26,001-33,000
Class 8	33,001-80,000*
Total	127,007-198,500
Average Weights:	Minimum =18,144 lbs; Maximum = 28,357 lbs

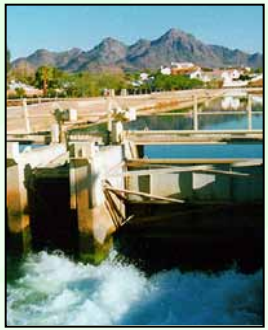
*Clark County substituted the maximum operating weight allowed in Nevada of 129,000 lbs for Class 8 vehicles



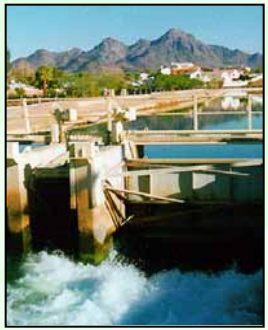
Average Vehicle Weight Calculation

- Truck weights can have a significant impact on average vehicle weight and resulting paved road PM-10 emissions
- For example, use of the minimum GVW for medium and heavy duty trucks (18,144 lbs) produces an average vehicle weight of 2.50 tons, while the maximum GVW (28,357 lbs) produces 3.05 tons
  - 22% increase in average vehicle weight
- When input to the paved road PM-10 equation, these weights produce emission rates of 0.21 g/mi for the min GVW vs. 0.25 g/mi for the max GVW
  - 19% increase in paved road emissions

Average Vehicle Weight Calculation

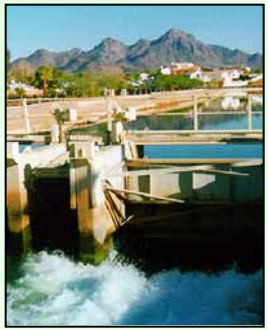


- **Data used to derive average vehicle weights in spreadsheet handout:**
  - Vehicle weights from Table 19 of the 2006 Clark County report
    - Assuming maximum GVWs for Class 2-8 trucks
  - Maricopa County vehicle registrations, as of July 1, 2010
    - Categorized by 8 vehicle classes in MOBILE6.2 (EPA onroad mobile source emissions model)
      - LDGV, LDDV, LDGT1 (<6001 lbs); LDGT2 (6001-8,500 lbs); LDDT (<8,500 lbs); HDGV and HDDV (>8,500 lbs); motorcycles



Average Vehicle Weight Calculation

- **Data used to derive average vehicle weights shown in spreadsheet handout (cont.):**
  - 2010 MAG traffic assignment with new truck model
    - VMT on freeways and non-freeways in the PM-10 nonattainment area
    - % of VMT on freeways and non-freeways attributable to medium duty (MED) and heavy duty vehicles (HDV)
      - MED + HDV = 16.28% of VMT on freeways
      - MED + HDV = 7.43% of VMT on non-freeways
- **Average vehicle weights to be used in estimating paved road PM-10 emissions for 2010 and beyond:**
  - Freeways = 3.73 tons
  - Non-freeways = 2.62 tons
  - Freeways + Non-freeways = 3.05 tons



Average Vehicle Weight Calculation

- **Alternative assumptions (for discussion)**
  - Use the maximum operating weight for Class 8 trucks in Arizona
    - Clark County used 129,000 vs. 80,000 lbs
  - Use mean or median, rather than maximum GVWs
  - Use actual truck weights, rather than GVWs
    - Weigh-in-motion data
    - Other sources?
  - Apply traffic counts collected by MAG in 2011 to calculate vehicle weights by axle class (1-13)
  - Other ideas?

For more information

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