MOBILE SAMPLING METHODOLOGY AS AN ALTERNATIVE TO TRADTIONAL AP-42 SILT MEASUREMENTS

CLARK COUNTY DEPARTMENT OF
AIR QUALITY AND ENVIRONMENTAL MANAGEMENT

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Introduction

- PM-10 SIP paved roads emissions inventory developed in 1999

- Used 24 sampling sites to determine AP-42 silt loadings

- Public works agencies very critical, argued 24 spot samples were not statically representative of the Clark County road network

Quarterly Silt Sampling

- From 2000 - Clark County sampled silt loadings each quarter

- Ambient PM-10 concentrations declined significantly beginning mid-2003

- Enhanced track-on controls and enforcement beginning early 2003

- Through 2005, silt loadings have not shown a statistically significant decline

Mobile Sampling System Basics

- Use front and rear sampling inlets
- Use GPS system for location coordinate and data time stamp
- Use isokinetic speed independent sampling systems
- On-board computer used for data recording and computing deferential emissions flux values

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Paved Road Studies – Phase II

- Study contractors and equipment:
  - DRI TRAKER system (Testing Re-entrained Aerosol Kinetic Emissions from Roads)
  - UCR CE-CERT SCAMPER system (System of Continuous Aerosol Monitoring of Particulate Emissions from Roadways)
  - UNLV (AP-42 sampling)

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Legend

AvgOfEF

- 0.036861 - 0.081997
- 0.081998 - 0.096922
- 0.096923 - 0.109589
- 0.109590 - 0.123021
- 0.123022 - 0.139861
- 0.139862 - 0.163684
- 0.163685 - 0.185409
- 0.185410 - 0.230433
- 0.230434 - 0.302439
- 0.302440 - 1.052711

5   2.5   0   5 Kilometers

Paved Road Studies – Phase II

- SCAMPER generally measures 0.1 to 0.3 vkt
- Where TRAKER measures high, scamper measures high

Paved Road Studies – Phase II

Day_	TRAKER Emission Factor Avergaed over all segments(g/vkt)	SCAMPER Emission Factor Averaged over all segments(g/vkt)	Ratio SCAMPER EF/ TRAKER EF
2/14/2005	0.185	0.062	0.34
2/15/2005	0.180	0.081	0.45
2/16/2005	0.176	0.029	0.17
2/17/2005	0.168	0.008	0.05
All Days Average	0.177	0.045	0.25
Standard deviation	0.007	0.033	0.18

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Paved Road Studies – Phase III

- Phase III study occurred November of 2005
- Study designed around SCAMPER system and AP-42 road silt samples
- Study focused on road infrastructure development and deposition sources for local, collector and arterial streets
- Utilized video recording system on SCAMPER
- Data variability less than in previous studies

Paved Road Studies – Phase III

- SCAMPER measurements spatially consistent with AP-42 estimates, but only 1/3 of the values

- Report provided emissions factors for various silt deposition sources and road infrastructure by road classification

- Region IX has requested additional uncertainty analysis and documentation

Paved Road Studies – Phase IV

- Planned Phase IV "empirical" study
  - Scope of work under development
  - Target date August 2006
- Planned Phase IV study components
  - Use both SCAMPER and TRAKER systems
  - AP-42 sampling
  - Upwind/downwind monitoring
  - Deposition of known quantities of "road silt"

TRAKER & SCAMPER Characteristics

- SCAMPER measures "downwind" behind vehicle

- TARAKER measures "downwind" behind wheel

- SCAMPER allows direct calculation of emissions factor

TRAKER & SCAMPER Characteristics

- ## SCAMPER design modular
  - Relatively easy to fit to larger vehicle
  - Does not require extensive modifications to vehicle

- ## SCAMPER more sensitive to crosswinds than TRAKER

- ## TRAKER requires one-time calibration for each version of vehicle

SCAMPER & TRAKER Characteristics

- TRAKER demonstrates greater degree of precision than SCAMPER

- TRAKER calibration is critical for accurate measurements
  - Early paved road measurements made with unpaved road calibration factors
  - Results were found to over estimate by a factor of approximately 25

Next Steps

- Will we continue to estimate our paved road emissions with 24 or 12 "spot" samples

  – For an entire metropolitan area paved road network?, or

  – For an entire region of the U.S.?

- Will we move into the 21st century?

How Do We Proceed?

- Evaluation Methods?
  - Upwind/downwind sampling comparisons
  - AP-42 silt sampling comparisons
  - Coefficient of variability assessments
- Develop performance criteria/standards for different systems? (How)
- Calibration libraries for different systems?

How Do We Proceed?

- How do we account for vehicle fleet mix?