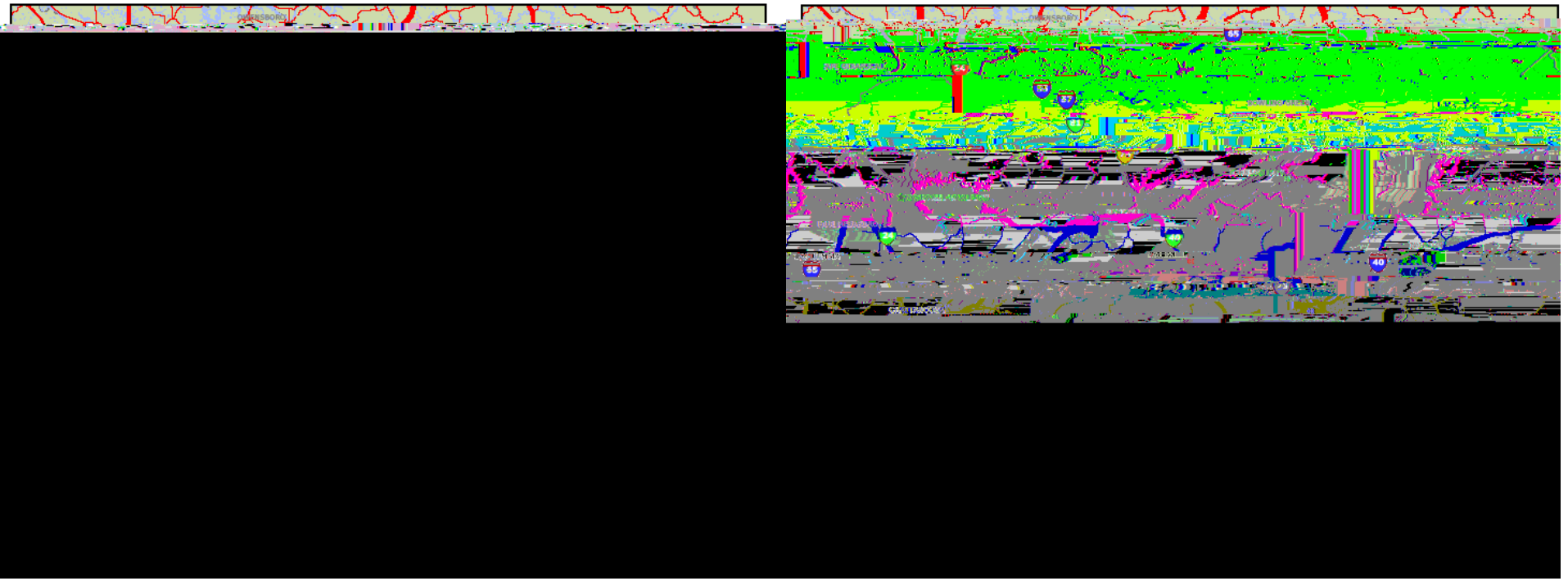
AADTT: Average Annual Daily Truck Traffic

1998 **2020**



50,000
25,000
12,500

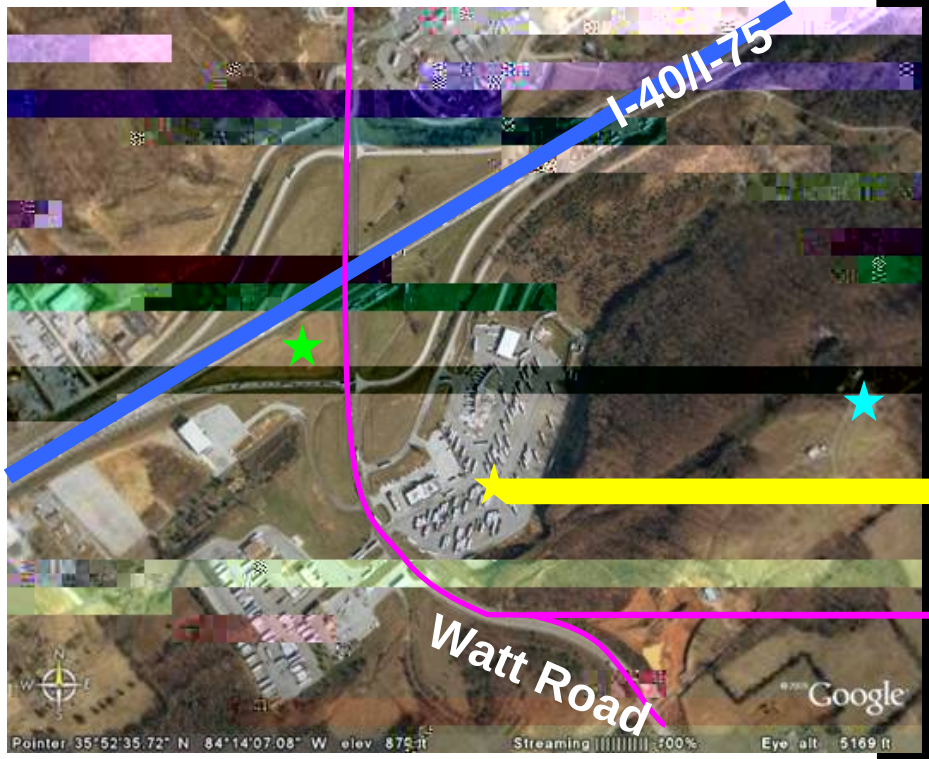

UT

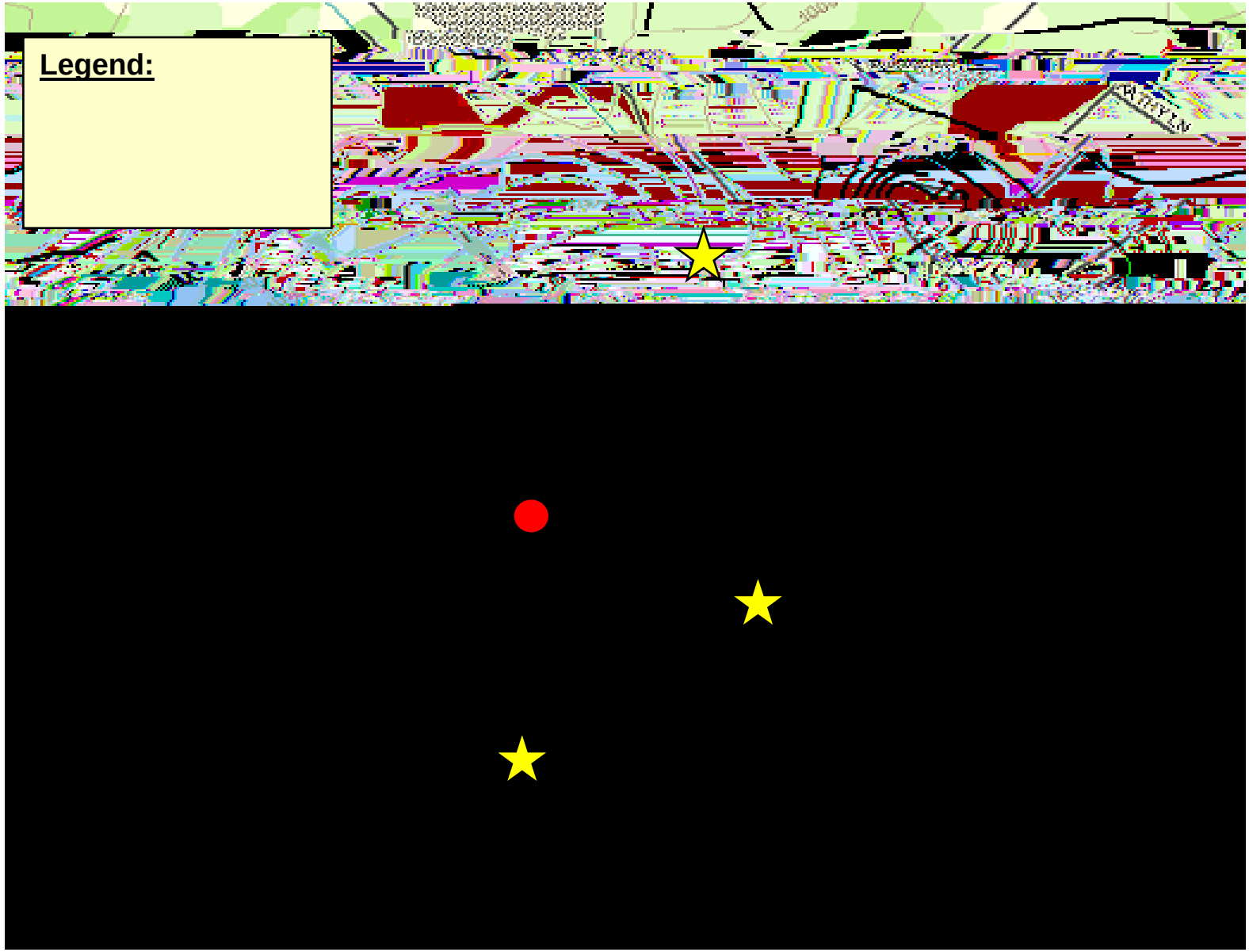
Field Campaigns at Watt Rd.

- **Air Quality Campaigns at Watt Road-I/40/75 Interchange**
  - **2003-2004 Truck stop air quality**
  - **2005 In-cab air quality**
  - **2004-2005 Roadside and Ridge top comprehensive**
- **Remote Sensing Campaigns at Weigh Station**
  - **Determine NOx Mass Emissions from NOx Concentration and Engine Operation**
    - **UV Spectroscopy for NOx Measurement**
    - **Acoustic Analysis for Engine Parameters**

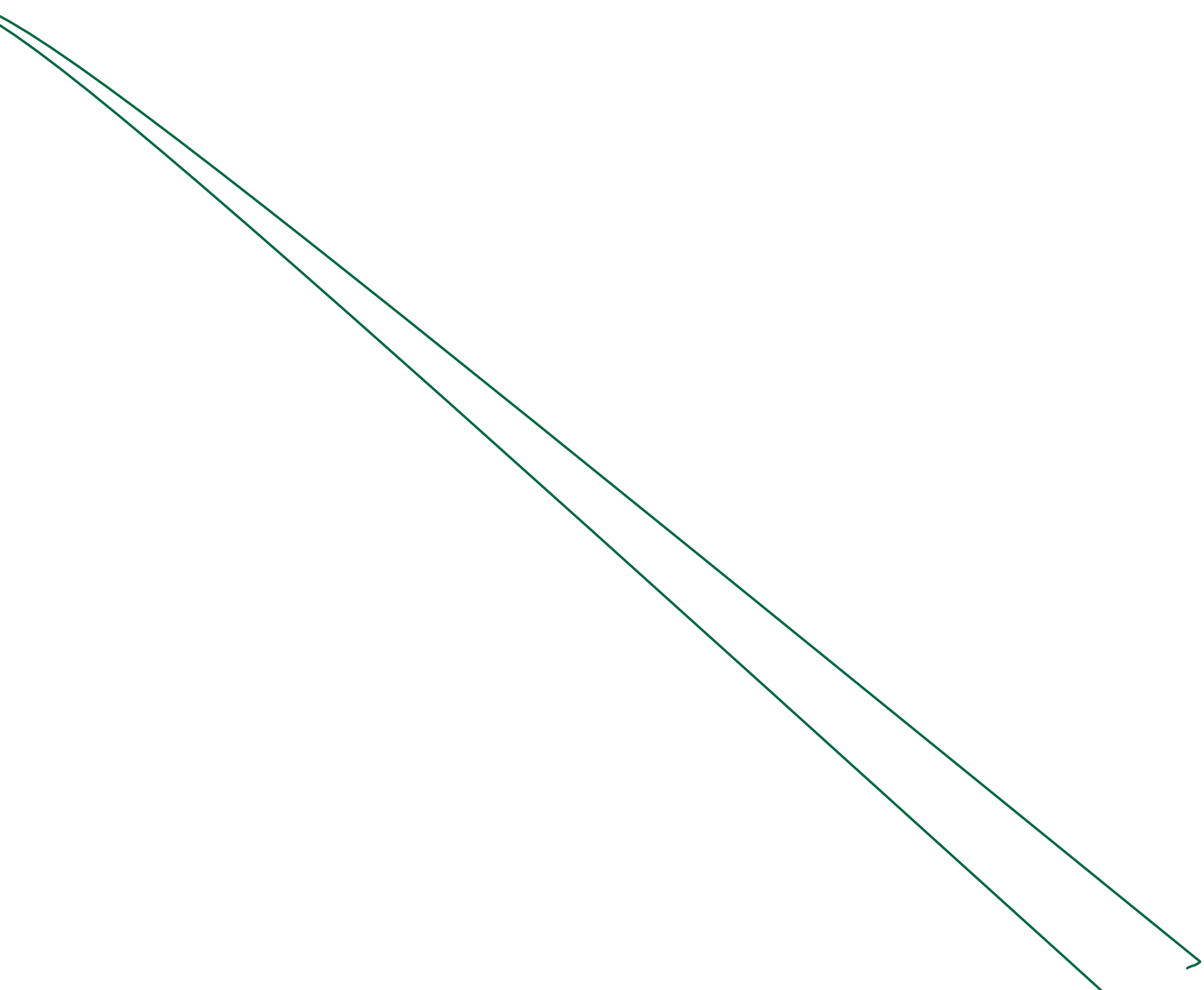
“Hot Spot” of High Pollutant Levels Formed by Idling Trucks at Truck Stops Near Roadway

- **Truckstops form “Hot Spots” of poor air quality**
  - **NOx, PM, MSATs elevated**
- **Boundary of “Hot Spot” difficult to define**
  - **Dependent on number of factors**
- **Recent health risk studies link higher risk to residency near heavily traveled roadways**
- **Further studies of “Hot Spots” warranted**
  - **Health impacts of 2007/10 technology introduction**





Isopleths of Predicted NOx Annual Concentrations (ppb) Ramp Site Location.

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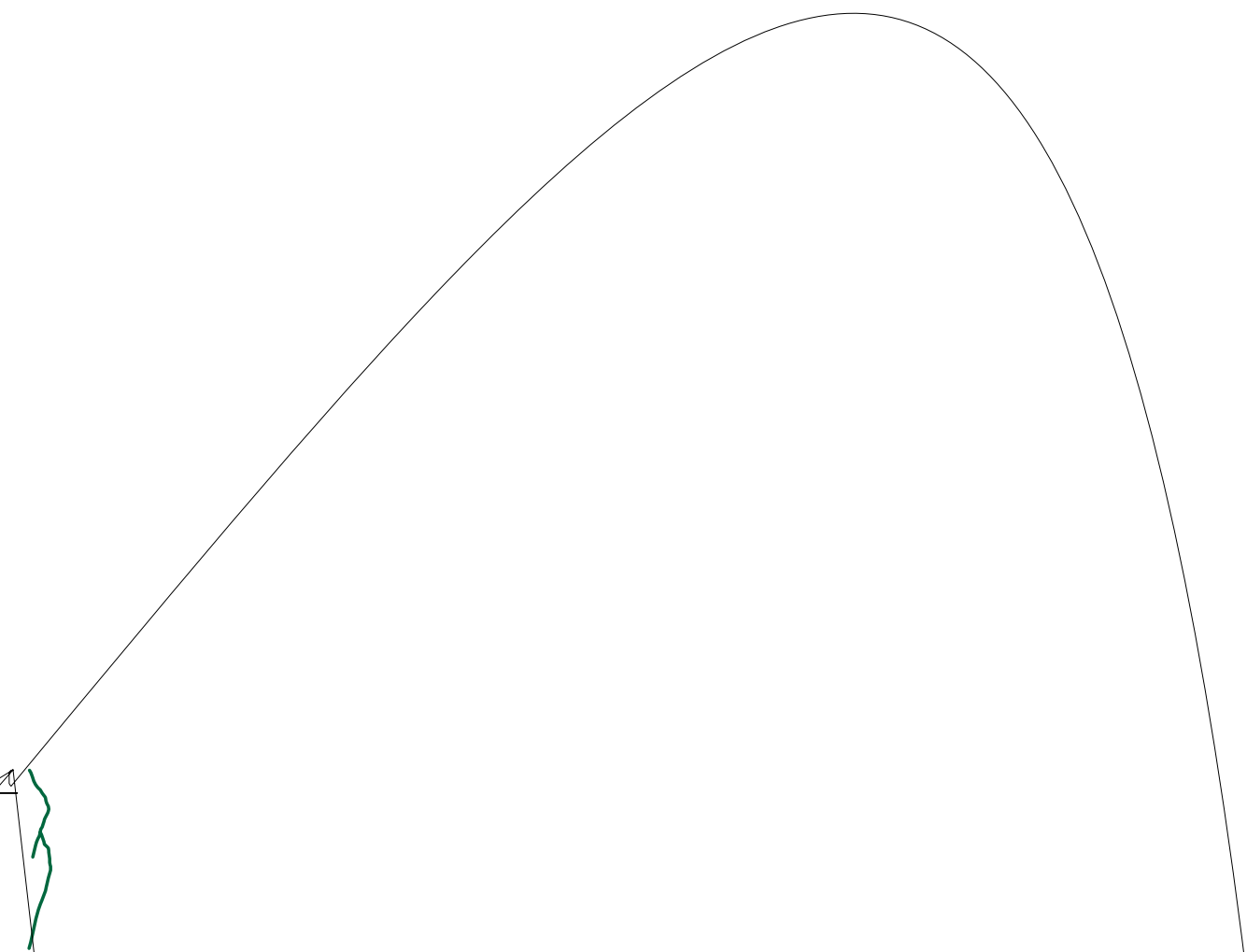
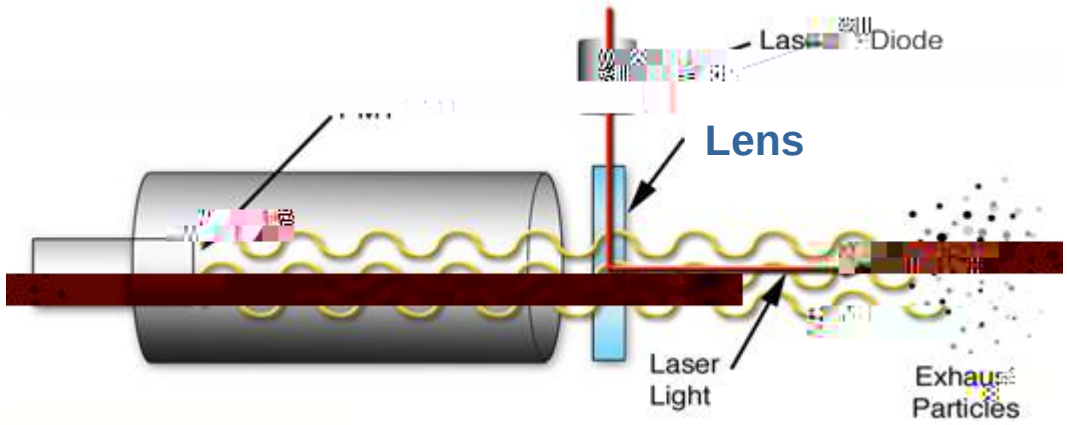
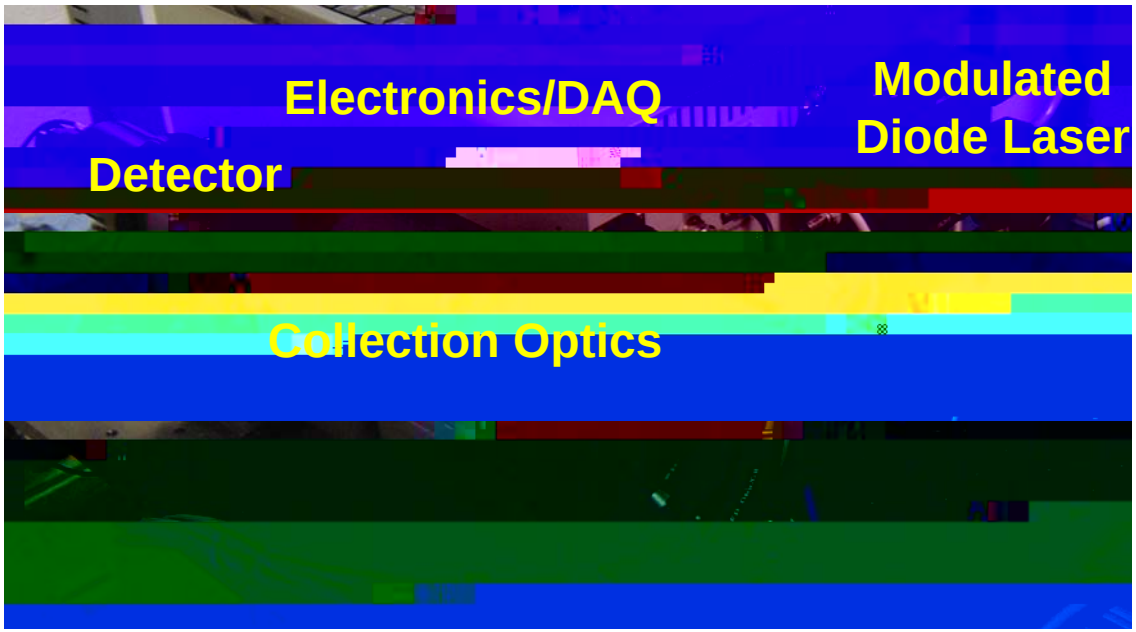


LIDAR Technique for Remote PM Density Measurement

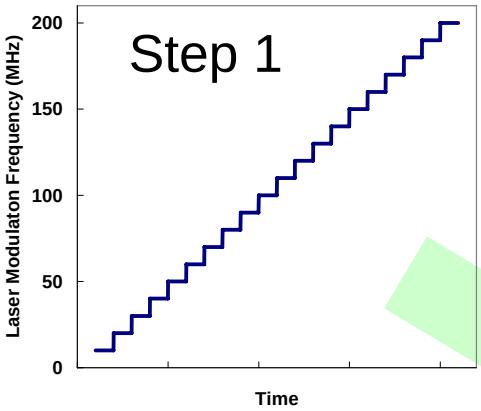
- **Novel methodology developed**
  - **Uses sequenced set of frequencies (10-200 MHz)**
  - **Can measure slices of a plume that is <1 m wide at 10 m away**
  - **Measures range and concentration of PM**

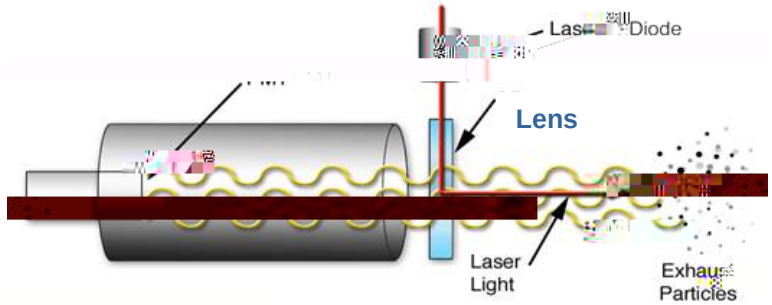




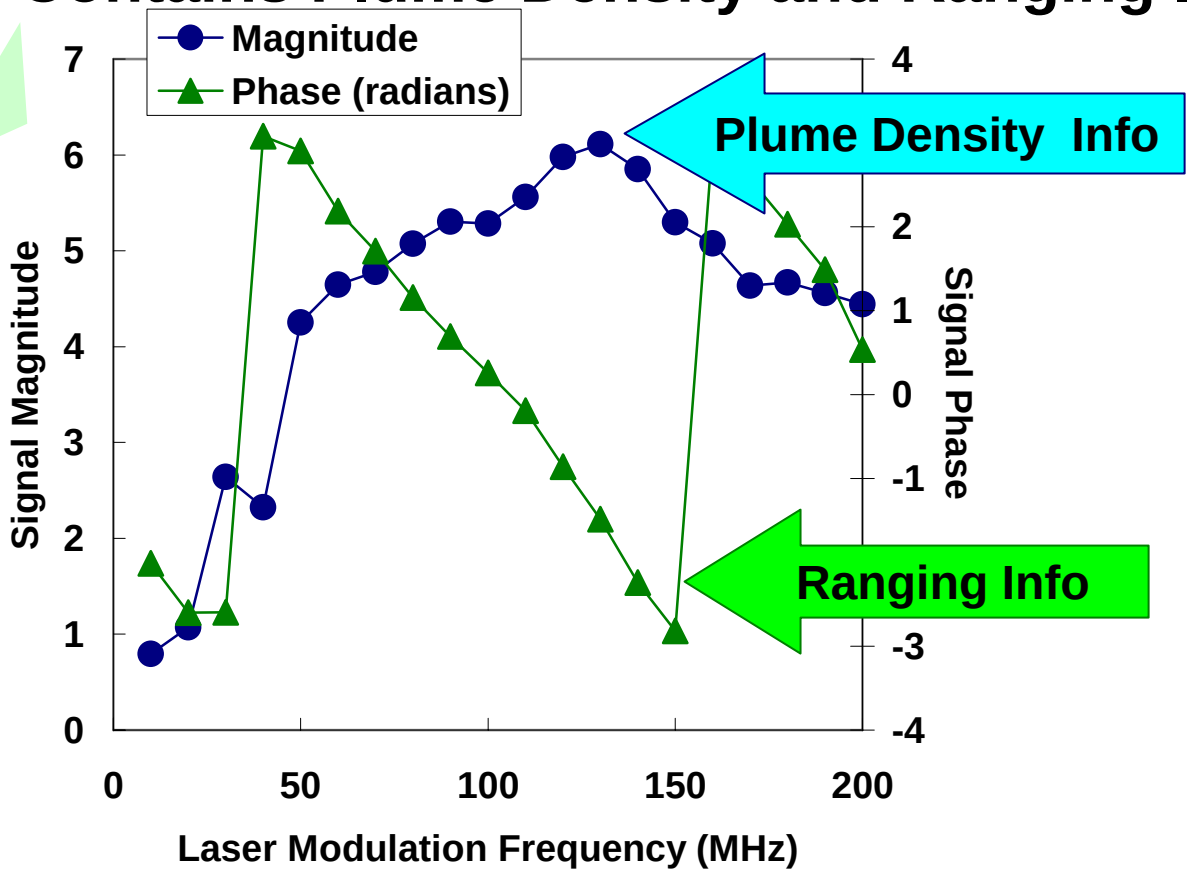
- **Recently upgraded LIDAR system; newest prototype has lower wavelength (λ) laser diode for improved sensitivity**
  - **Scattering coefficient is inversely proportional to λ^4**

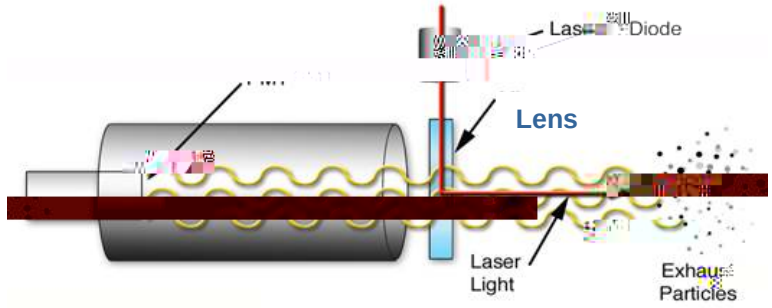
How LIDAR Works





- **Step 2: Collected Scattered Light Signal Contains Plume Density and Ranging Info**





- **Step 3: Fourier Transform Analysis of Signal Yields Particle Density as a Function**

LIDAR Results: Weigh Station April 2006

- Preliminary data shows LIDAR detection of PM from passing trucks
- Sensitivity and speed are issues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Future Plans: Focus on Impact of Introduction of New Emission Control Technologies

- **Introduction of MY2007 Trucks**
  - Continued deployment of remote sensing for NOx, PM, and MSATs
- e2i0[511111111111a0lectrificaroducsin Idl(senmote)Tj -0.0022 Tc 0 Tw 0 31.199ReIntr

Interactions in FY06

- **Publications:**
  - **Simpson, M. L. *et al.,* "Intensity-modulated, stepped frequency CW lidar for distributed aerosol and hard target measurements," *Applied Optics*, 44, pp.7210-7217. 2005**
  - **Paper submitted to the Air and Waste Management (AWMA) conference (scheduled for June 2006 in New Orleans)**
- **(2) Posters presented at 16th CRC On-Road Vehicle Emissions Workshop on March 28-30, 2006 in San Diego, CA**
- **(1) Patent pending on acoustic technique for remote sensing of engine parameters (US Application No. 10/922,023, "Truck Acoustic Data Analyzer System")**
- **Meetings:**
  - **EPA at Research Triangle Park (Raleigh-Durham, NC) in Jan. 2006**
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