National Traffic Dataset Applications for Air Quality Analysis

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Introduction

- Ongoing Research Project: "National Traffic Dataset Applications for Air Quality and Noise Analysis"
- Contractors: Cambridge Systematics with ERG and AECOM
- Initial task to combine 3 FHWA databases
- Four Potential Applications
  - Two air quality applications (covered later)
  - Two noise applications (not covered)
    - Noise Worst-Case Hour Determination
    - 24-hour Traffic Distribution for Noise Analysis

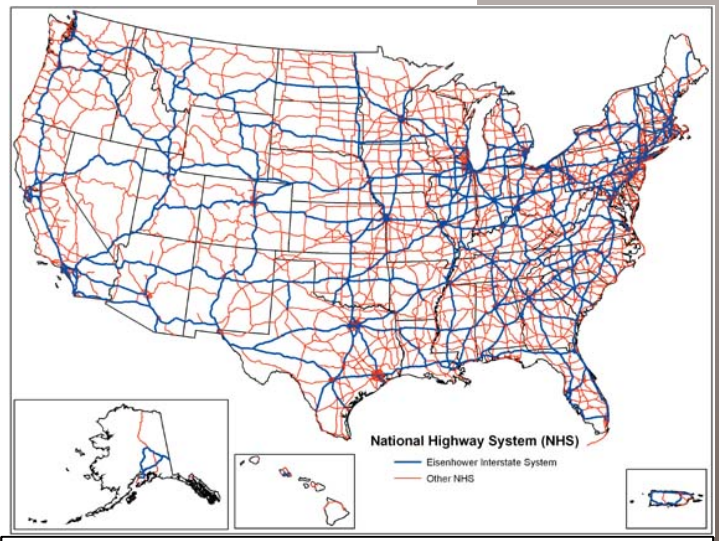
Outline

- Background
- Data Sources
- Building a Combined Database
- Air Quality Applications

BACKGROUND

Background

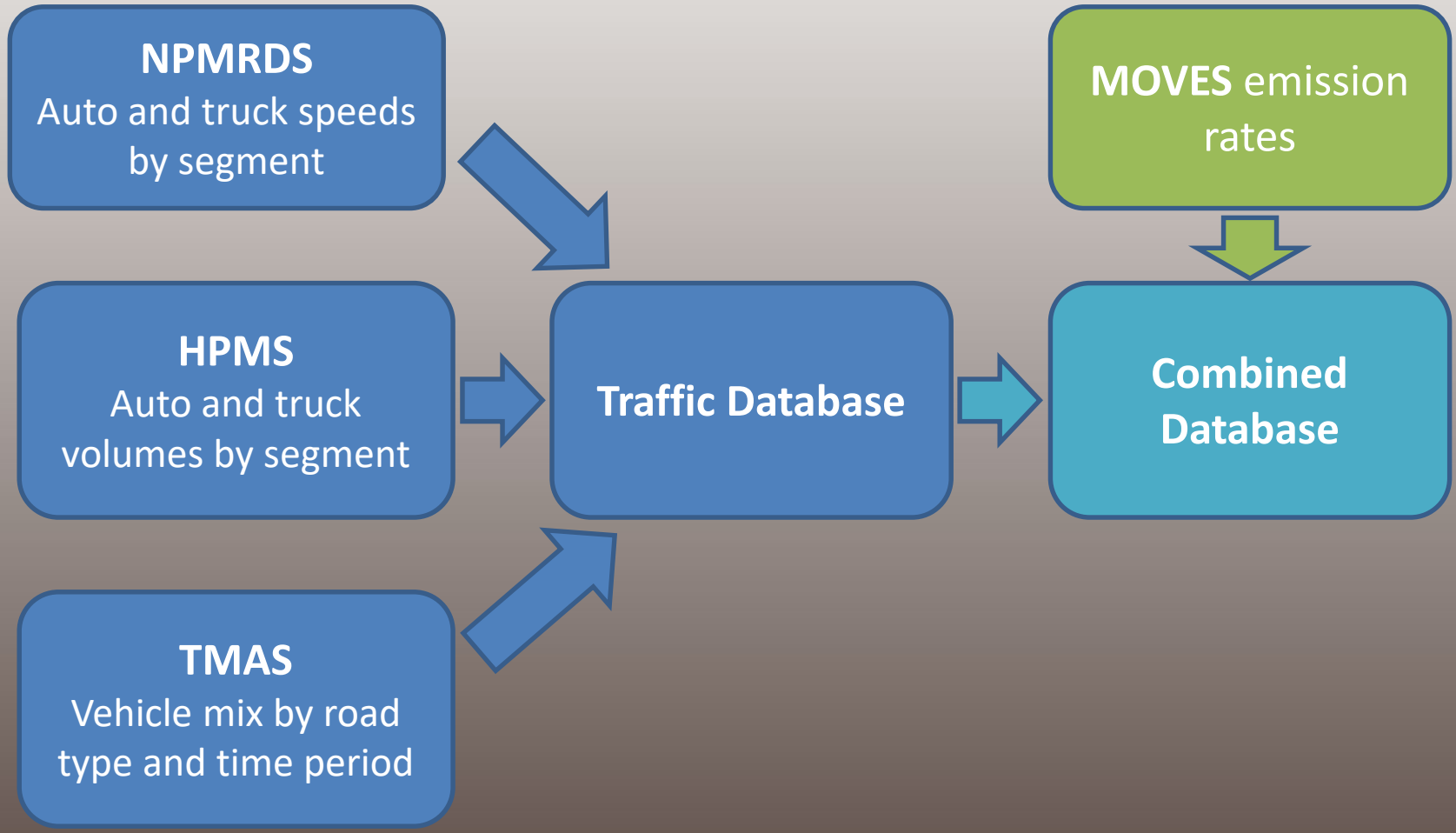
- Data Availability
  - FHWA - National Performance Management Research Dataset (NPMRDS)
  - Probe based data in general – some locations using this data for AQ
- National Database
  - Reduce data collection burden for State DOT and MPOs
  - Improve consistency
- Other Research by NCHRP, CRC, and EPA to use telematics data for MOVES



Source: https://en.wikipedia.org/wiki/National_Highway_System_(United_States)

DATA SOURCES

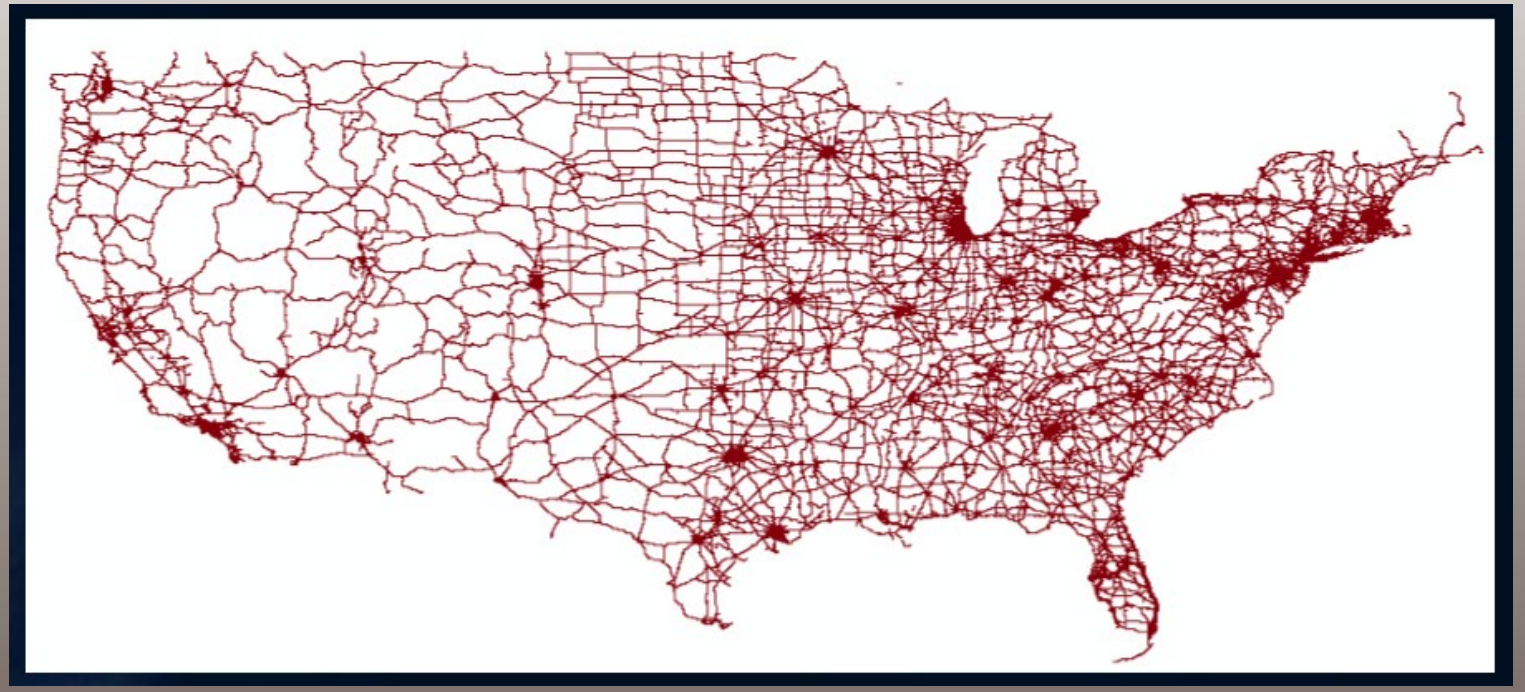
Data Sources



National Performance Management Research Dataset (NPMRDS)

- A package of vehicle probe data procured by FHWA
  - 1st procurement (NPMRDS v1): July 2013
  - 2nd procurement (NPMRDS v2): April 2017
- Archived travel time and speed;
- AADT(if available) is conflated from HPMS
- Resolution: 5-minute intervals on over 400,000 TMC segments
- Coverage: National Highway System, 26 border crossings
- Travel time and speed by vehicle type:
  - Passenger vehicles
  - Trucks
  - All (passenger vehicles and trucks)

NPMRDS Network



Note: Alaska, Hawaii, and Puerto Rico also have TMC shapefiles that are not shown here.

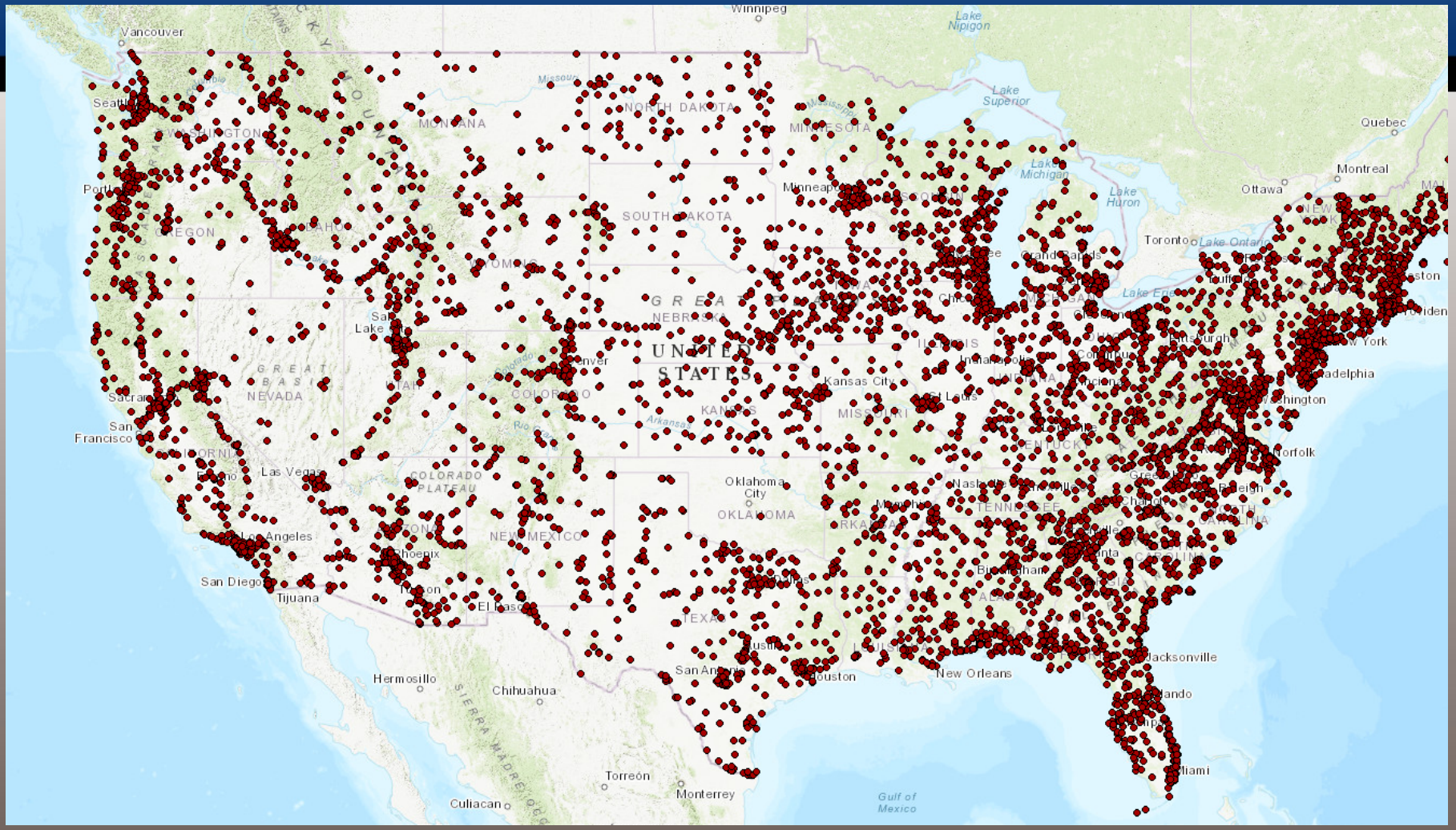
Highway Performance Monitoring System (HPMS)

- Developed in 1978
- Roadway condition & performance data
- Used to help determine apportionment of Federal-aid funds
- Key source of data for Conditions & Performance (C&P) Report to Congress
- Relevant data fields:
  - AADT
  - Single Unit Truck AADT
  - Combination Truck AADT

Travel Monitoring Analysis System (TMAS)

- Internal FHWA data program for development of policies and regulations.
- Monthly data are published in the Traffic Volume Trends (TVT) report
- 6,000 continuous monitoring sites – volume
  - 2,400 also monitor vehicle class
  - About 550 also monitor truck weight
- Vehicle class data being used for this project
- Archived volume data publicly available at: https://www.fhwa.dot.gov/policyinformation/tables/tmasdata/

TMAS Traffic Monitoring Stations



http://www.arcgis.com/home/webmap/viewer.html?url=https%3A%2F%2Fmaps.bts.dot.gov%2Fservices%2Frest%2Fservices%2FNTAD%2FTravel_Monitoring_Analysis_System%2FMapServer&source=sd

BUILDING A COMBINED DATABASE

Building a Combined Database

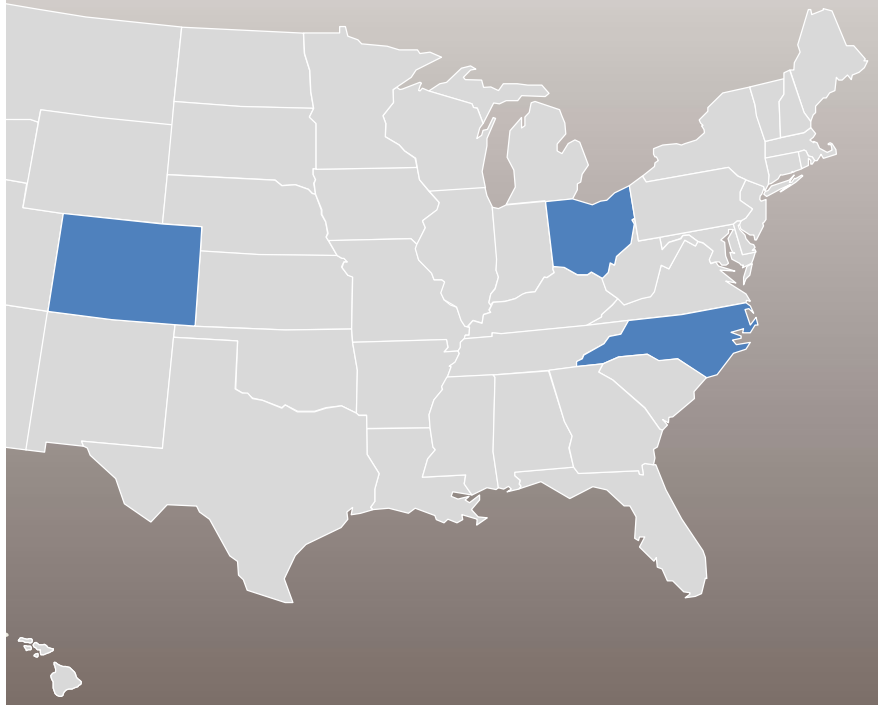
- HPMS data already conflated onto NPMRDS network
- Four tiers of matching TMAS point data to NPMRDS line network
  - Tier 1: Near exact location match
  - Tier 2: Matching on county and route
  - Tier 3: Matching on statewide average by functional class
  - Tier 4: Matching on national average by functional class
- Lookup classification data by peaking, month, weekday/weekend, and hour

Phase 1 Details

	Description
Geographic Coverage	3 states (OH, CO, NC)
Years of Data	1 year (2017 NPMRDS, 2015 HPMS & TMAS)
Conflation Used	NPMRDS v2 work (HPMS data onto NPMRDS network)
Geographic Unit	TMCs from NPRMDS Network
Time Aggregation	Hourly Level

Phase 1 States

- Selection Factors
  - #
  - U
  - G
    Di
- State
  - O
  - C
  - N



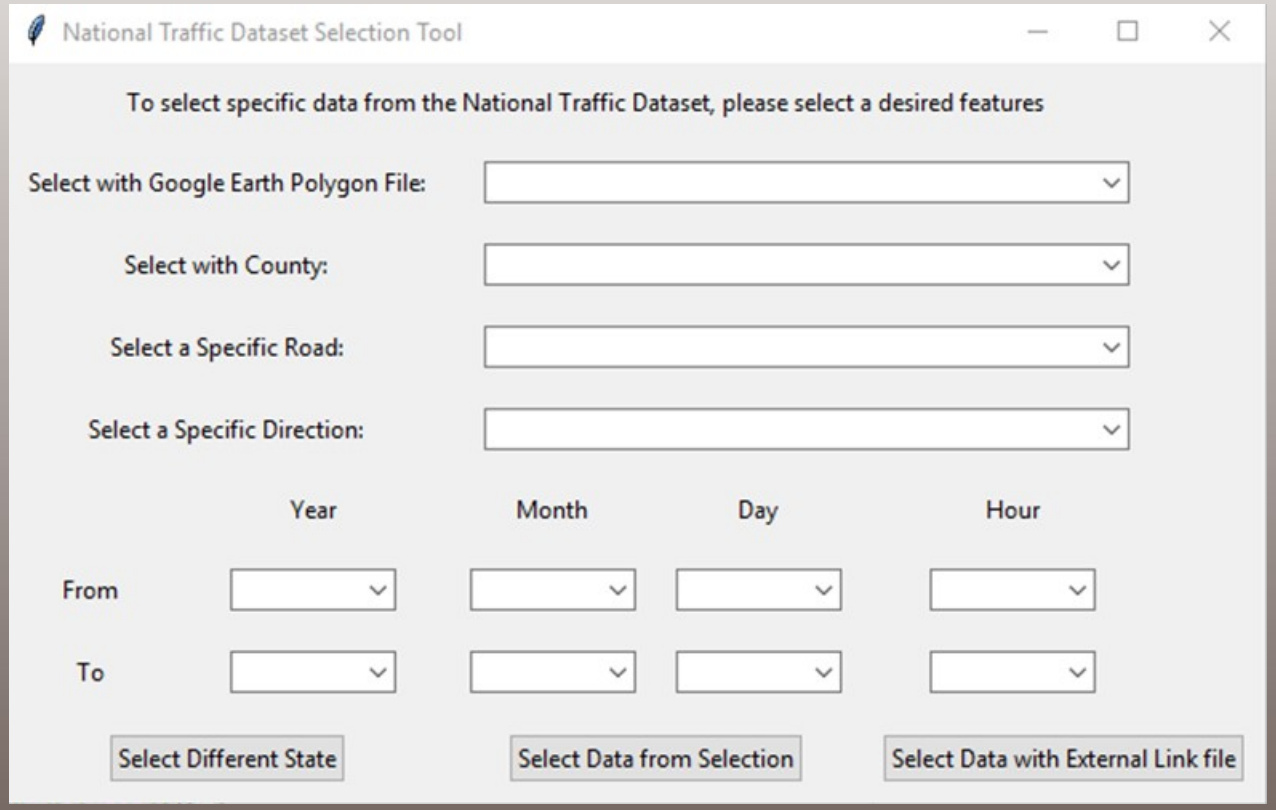
Size of Data

- 24 hours/day * 365 days/year = 8,760 lines (rows) of data per TMC per year
- 44 fields (columns)

State	TMCs	Lines of Data – 1 year	Data Size (GB) - 1 year	Data Size (GB) - 3 years
Ohio	13,777	120,686,520	22.8	68.4
North Carolina	12,004	105,155,040	21.6	64.8
Colorado	6,457	56,563,320	11.6	34.8
United States (estimate)	385,000	3,372,600,000	673.9	2,021.6
Excel Limit	-	1,048,576	-	-
Access Limit	-	-	2.0	2.0

~2 TB of data!

Example of Portion of GUI Tool



AIR QUALITY APPLICATIONS

Link Level Emissions Processor

- Link-level database could potentially be used for project-level air quality analysis since it will have VMT by vehicle type and speeds
- Emission rates will be matched to links in the combined database based on:
  - State
  - Road type
  - Vehicle type
  - Speed

MOVES County Level Inputs

- Use combined link-level database to calculate MOVES inputs for every county:
  - Average Speed Distribution;
  - Vehicle Type VMT following the (HPMSVTypeYear format);
  - Road Type Distribution;
  - Hour VMT Fraction;
  - Day VMT Fraction; and
  - Month VMT Fraction.
- Could potentially be used for regional air quality modeling

Questions?

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