

DANA Tool 2.1

Database for Air Quality and Noise Analysis



U.S. Department of Transportation
Federal Highway Administration

DANA is a tool created by the Federal Highway Administration (FHWA) to process historical traffic data. The tool combines traffic data from existing data sources into a single database. It then processes the combined data into properly formatted inputs for EPA's Motor Vehicle Emission Simulator (MOVES) model and for the newly integrated Traffic Noise Model Aide (TNMAide) Tool. DANA provides real-world traffic conditions for use in planning and environmental analyses, instead of relying on models to generate base year traffic data. Finally, DANA helps ensure that environmental analyses use a consistent set of traffic data and processing methods across the entire country. FHWA provides the DANA tool as a resource to stakeholders and use of the tool is voluntary¹.

Improvements for Version 2.1:



Incorporated TNMAide functionality directly within the DANA Tool



Improved and expanded data-filling algorithms for missing NPMRDS speed and TMAS vehicle classification count data



Added computation to account for total traffic volume variations by month and weekday/weekend



Expanded link-level summary output file to include Worst Noise Hour and Average Day noise metrics



Added interactive GIS tool to assist in TMC Selection for TNMAide input



Reduced memory requirements for large input datasets



Figure 1. Map of National Highway System
(Source: FHWA)

Potential Uses:

- Assisting in completing noise analyses for NEPA documents by identifying the worst noise hour and associated traffic characteristics for a given year.
- Planning analyses to identify locations for highway projects and pollution reduction strategies.
- MOVES county-level runs completed for various purposes, such as mobile source air toxics analysis.
- Studying the traffic, noise, and emissions on a highway segment before and after a highway project opening

Obtain a Copy:

- https://www.fhwa.dot.gov/environment/air_quality/methodologies/dana
- Contains the tool, documentation, and default input data

Recommended Hardware:

- A powerful CPU (e.g., Intel i7 or better)
- 16 GB of free RAM, or more

¹ Using DANA and/or TNMAide may not satisfy all regulatory requirements.

DANA uses three existing FHWA data sources:

1. **National Performance Management Research Data Set (NPMRDS)** Continuously collected speed and travel time data for the entire NHS, which are compiled at 1-hour intervals for unidirectional highway segments. The data are collected from GPS-equipped probe vehicles by a private vendor and provided under contract to FHWA. The raw NPMRDS data are available for use by state and local transportation agencies, and agencies must have access to their state's NPMRDS data to use DANA.²

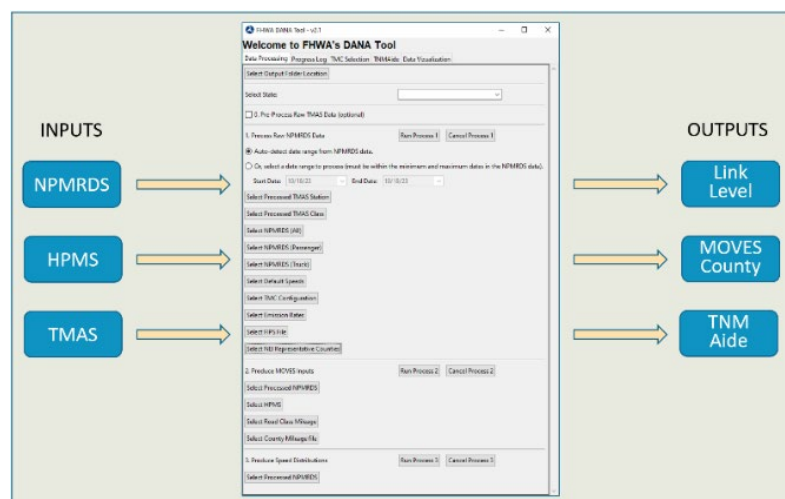


Figure 2. DANA Tool Uses Three Datasets to Create Link-Level and County-Level Inputs for EPA MOVES and FHWA's TNMAide (Source: FHWA)

2. **Highway Performance Monitoring System (HPMS)** Geometric, operating and traffic data submitted annually by state Departments of Transportation (DOTs) to FHWA. The NPMRDS has several HPMS data elements integrated including average annual daily traffic (AADT) and highway functional classification.³ Additionally, FHWA county road mileage and state-level VMT files, derived from HPMS, are used as input to DANA.

3. **Travel Monitoring Analysis System (TMAS)** Vehicle classification data collected by the state DOTs at approximately 2,400 locations throughout the country and submitted to FHWA annually. The classifications are based on FHWA's classification scheme but are converted to the vehicle types used in emissions and noise analyses.⁴

DANA creates three output datasets:

1. **Link-Level Data Set and Summaries** The main output of the DANA tool is a detailed dataset containing traffic data for every NPMRDS link (NHS roadways) for every hour of the year. The dataset contains speeds and travel times along with the hourly percent of MOVES vehicle types and TNM vehicle types. Emission rates derived from the national emissions inventory are also included. Additional files contain summaries of the data in the link level dataset, including an annual aggregation of the traffic volumes on each NPMRDS link, sums of emissions inventories for the year, and annual aggregate noise metrics for each link.
2. **MOVES County-Level Input Data Set** For the counties provided in the inputs, the following MOVES inputs are produced: Average Speed Distribution; Vehicle Type VMT, Road Type Distribution; Hour VMT Fraction; Day VMT Fraction; and Month VMT Fraction. DANA uses national VMT aggregations to produce total VMT in the entire county, not just VMT on NHS links.
3. **Traffic data summaries for TNMAide** Full-year, link-level traffic data summaries output by the DANA tool serve as inputs to TNMAide. These data can be used directly in DANA's TNMAide tab or can be used separately by using the stand alone TNMAide scripts. TNMAide then computes:
 - **Worst Case Noise Hour Analysis** Identifies the single worst day and the worst noise hour of the day (averaged over all days) along with traffic volumes and average speeds for that hour.
 - **Estimated Noise Levels at fifty feet** Estimates the link-level Average Hourly A-weighted (LAeq), Day-Night (Ldn), and Day-Evening-Night (Lden) levels based on hourly traffic volumes, speeds, and Reference Energy Mean Emission Levels (REMELs).
 - **24-Hour Traffic Distribution for Noise Analysis** Creates link-level hourly distributions over a 24-hour period that can be entered into FHWA's TNM for calculation of the Ldn and Lden.

² For more information on NPMRDS see: https://ops.fhwa.dot.gov/perf_measurement/index.htm

³ For more information on HPMS see: <https://www.fhwa.dot.gov/policyinformation/hpms.cfm>

⁴ For more information on TMAS see: <https://www.fhwa.dot.gov/policyinformation/tmguide/>