Data Collection and AADT Estimation for Non-Federal Aid System (NFAS) Roads
Project Team

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• HSIP Final Rule: States must have access to AADT for ALL public paved roads by Sep 30, 2026

• Limited traffic data collection efforts on NFAS roads:
  – Rural minor collectors (6R)
  – Urban local roads (7U)
  – Rural local roads (7R)
NFAS Roads

<table>
<thead>
<tr>
<th>HPMS Functional Class</th>
<th>Total Length (mi)</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>1R - Rural Interstates</td>
<td>29,133</td>
<td>0.7%</td>
</tr>
<tr>
<td>2R - Rural Other Freeways and Expressways</td>
<td>6,378</td>
<td>0.2%</td>
</tr>
<tr>
<td>3R - Rural Other Principal Arterials</td>
<td>89,728</td>
<td>2.2%</td>
</tr>
<tr>
<td>4R - Rural Minor Arterials</td>
<td>133,809</td>
<td>3.2%</td>
</tr>
<tr>
<td>5R - Rural Major Collectors</td>
<td>407,650</td>
<td>9.8%</td>
</tr>
<tr>
<td>6R - Rural Minor Collectors</td>
<td>258,477</td>
<td>6.2%</td>
</tr>
<tr>
<td>7R - Rural Local Roads</td>
<td>2,002,878</td>
<td>48.4%</td>
</tr>
<tr>
<td>1U - Urban Interstates</td>
<td>19,058</td>
<td>0.5%</td>
</tr>
<tr>
<td>2U - Urban Other Freeways and Expressways</td>
<td>12,255</td>
<td>0.3%</td>
</tr>
<tr>
<td>3U - Urban Other Principal Arterials</td>
<td>66,137</td>
<td>1.6%</td>
</tr>
<tr>
<td>4U - Urban Minor Arterials</td>
<td>112,384</td>
<td>2.7%</td>
</tr>
<tr>
<td>5U - Urban Major Collectors</td>
<td>129,173</td>
<td>3.1%</td>
</tr>
<tr>
<td>6U - Urban Minor Collectors</td>
<td>16,961</td>
<td>0.4%</td>
</tr>
<tr>
<td>7U - Urban Local Roads</td>
<td>856,085</td>
<td>20.7%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>4,140,108</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Source: Highway Statistics 2016, FHWA, Office of Highway Policy Information
## Roadway Ownership

<table>
<thead>
<tr>
<th>Agency - Roadway Owner</th>
<th>Rural Minor Collectors (6R)</th>
<th>Rural Local (7R)</th>
<th>Urban Local (7U)</th>
<th>Total</th>
<th>Percent of Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>County</td>
<td>175,471</td>
<td>1,184,588</td>
<td>181,047</td>
<td>1,541,106</td>
<td>49.4%</td>
</tr>
<tr>
<td>Town, Township, Municipal</td>
<td>12,757</td>
<td>532,539</td>
<td>631,302</td>
<td>1,176,598</td>
<td>37.7%</td>
</tr>
<tr>
<td>State Highway Agency</td>
<td>60,015</td>
<td>121,994</td>
<td>32,393</td>
<td>214,402</td>
<td>6.9%</td>
</tr>
<tr>
<td>Federal Agency</td>
<td>7,632</td>
<td>119,767</td>
<td>7,901</td>
<td>135,301</td>
<td>4.3%</td>
</tr>
<tr>
<td>Other Jurisdictions</td>
<td>2,602</td>
<td>43,990</td>
<td>3,442</td>
<td>50,034</td>
<td>1.6%</td>
</tr>
<tr>
<td>Total</td>
<td>258,477</td>
<td>2,002,878</td>
<td>856,085</td>
<td>3,117,441</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

| Percent of Total       | 8.3%                       | 64.2%            | 27.5%            | 100.0%      |

Source: Highway Statistics 2016, FHWA, Office of Highway Policy Information
Objectives

• Identify Noteworthy Practices
• Select Appropriate Methods
• Calculate Accuracy
• Determine Safety Analysis Sensitivity
• Cost
Main Research Activities

• Develop Informational Guide on data collection and AADT estimation for NFAS roads
  – Use AADT in data-driven safety analysis
  – Assist State, tribal, MPO, local, and Federal agencies

• Literature Review

• Develop 4 case studies:

• Conduct 6 pilot studies
Safety Data Integration Framework

Framework

Preparation

1. Lay the Foundation
2. Conduct Gap Analysis
3. Establish Data Governance Process
4. Develop Data Collection and Integration Plan

AADT Estimation

A) Traffic Count Based
B) Non-Traffic Count Based
C) Travel Demand Models
AADT Estimation

A) Traffic Count Based
   “Traditional” Approach and Sampling
   Non-Traditional Methods

B) Non-Traffic Count Based
   Disaggregated Estimates at the Segment Level
   Aggregated Estimates (e.g., County Level)

C) Travel Demand Models
AADT Estimation

A) Traffic Count Based

“Traditional” Approach and Sampling

• Roadway Stratification
• Variables
• Correlations with AADT
• Decision Trees
• Random Sampling

B) Non-Traffic Count Based

Non-Traditional Methods

Disaggregated Estimates at the Segment Level

Aggregated Estimates (e.g., County Level)

C) Travel Demand Models

AADT Estimation

1968
AADT Estimation

A) Traffic Count Based

“Traditional” Approach and Sampling

Non-Traditional Methods

• Regression
• Support Vector Machines
• Neural Networks
• ...

B) Non-Traffic Count Based

Disaggregated Estimates at the Segment Level

Aggregated Estimates (e.g., County Level)

C) Travel Demand Models

Literature Review identified methods but we did not identify any in practice. Universities?
AADT Estimation

A) Traffic Count Based
- "Traditional" Approach and Sampling
- Non-Traditional Methods

B) Non-Traffic Count Based
- Disaggregated Estimates at the Segment Level
- Aggregated Estimates (e.g., County Level)

C) Travel Demand Models

• Regression
• Probe data
• ITE Trip Generation Method
• OD data
VDOT – Innovative Procedures in Traffic Volume Estimation
Background

• VDOT maintains 58,340 centerline miles
  – 78% of centerline miles of public roads
• Collected roadway inventory data for 95% of intersections
• Counted 98% of local roads
• More than 600 continuous count sites
Trip Generation Method

- Implemented on certain roads in place of field counts
- Aimed to reduce data collection costs
- Use ITE trip generation theory
Implementation Guidelines

• Roads with one point of entry, are residential in nature, and have a length of 0.5 miles or less
• Region/district staff decide whether to conduct 24-hour count or use trip generation method
• Volume estimates represent average volume over roadway not highest volume at entrance/exit
Selection of Traffic Links

• Review recent aerial imagery
• Single-family detached housing only
• Single point of vehicle access
• Identify if unusual land uses are nearby
  – Metrorail station
Average Volume Estimate

- $V =$ number of trips per weekday
  $$\nu = 10 \times (H_b + 0.5H_s)$$
- $H_b =$ number of households in bulb of cul-de-sac
- $H_s =$ number of households in stem of cul-de-sac
Steps for Trip Generation Estimation

1. Count all houses in cul-de-sac
2. Count only houses in bulb of cul-de-sac
3. Add houses from step 1 and 2 and multiply by 5
4. Report this result as number of trips per day for cul-de-sac to VDOT Central Office
5. Send spreadsheet at least once per year for inclusion in annual publications
Trip Generation Method Example

1. Houses in cul-de-sac = 9

2. Houses in bulb = 3

3. \( V = (9 + 3) \times 5 = 60 \)
Trip Generation Method Example

1. Houses in cul-de-sac = 38

2. Houses in bulbs = 17

3. $V = (38 + 17) \times 5 = 275$
Trip Generation Method Results

- Applied trip generation method in VT and NC
- Mean Absolute Percent Error: VT = 27%, NC = 25%
Costs and Other Considerations

• Contractor versus in house
  – Contractor rates $20-$30 per hour
• 15-30 minutes for each link
• Some visit field and collect necessary data rather than use aerial photography
Benefits

• Reduced data collection costs
• Cost savings in equipment purchase, maintenance, and calibration
• Reduced data collection time
Lessons Learned

• Cheaper to use VDOT staff than consultants
• Need clear implementation plan and specific roles
• Instructions and illustrated examples facilitate implementation
• Consider needs and preferences of all region and district staff to secure buy-in
• May need to visit field to collect data if aerial photography is dated or hard to distinguish