Traffic in ME Design

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Why is traffic important to pavement design?
Percentage Class 9 Tandem Axles

Axle Load (kips)

AASHTO 1993 Design Procedure

Load Repititions to Failure
United States Truck Weights

Axle Load (kips) vs. Load Repetitions to Failure

Percentage Class 9 Tandem Axles

Axles
Damage vs. axle weight

- Tandem axle load, kips
- Remaining traffic, %
- Cumulative damage, %

< 5% of traffic
58% of total damage
What information do we need?
Information we need:

- Volume
- Classification
- Weight

Design lane only
Heavy vehicles only
Truck Volume

- Lane Distribution
- Direction Distribution
- Growth Factors
- Seasonal
- Hourly distribution (PCC only)
Seasonal Truck Volume Variation
Screen Inputs

Traffic

Design Life (years): 20
Opening Date: October, 2006

Initial two-way AADTT: 2600
Number of lanes in design direction: 2
Percent of trucks in design direction (%): 50.0
Percent of trucks in design lane (%): 95.0
Operational speed (mph): 60

Traffic Volume Adjustment: Edit
Axle load distribution factor: Edit
General Traffic Inputs: Edit

Traffic Growth: Compound, 4%

OK Cancel

Import/Export
Truck Growth

Monthly Traffic Growth

- By class
- Liner
- Compound

Note: Vehicle-class distribution factors are needed to view the effects of traffic growth.
### Vehicle Class Distribution

<table>
<thead>
<tr>
<th>Class</th>
<th>AADTT Distribution</th>
</tr>
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<tbody>
<tr>
<td>Class 4</td>
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<td>Class 13</td>
<td>15.3</td>
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<td>Total</td>
<td>100.0</td>
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</table>

13 FHWA Classifications
Only concerned with trucks
Vehicle Weight
Vehicle Weight (Axle Load Spectra)

17% of Single Axles Class 9 Vehicles Weigh 10 kips
MEPDG Input screen

Axle Load Distribution Factors

- **Axle Load Distribution**
  - Level 1: Site Specific
  - Level 2: Regional
  - Level 3: Default

- **View**
  - Cumulative Distribution
  - Distribution

- **Axle Types**
  - Single Axle
  - Tandem Axle
  - Tridem Axle
  - Quad Axle

Axle Factors by Axle Type

<table>
<thead>
<tr>
<th>Season</th>
<th>Veh. Class</th>
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<td>3.99</td>
<td>6.8</td>
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Tandem Axle Load Distribution
Lightly Loaded Trucks

Maximum Weight in a Given Axle Weight Group (x 1,000 lbs)

Fraction of Tandem Axles In Weight Group
ESAL Comparison

Lightly Loaded = 0.186 (flexible)
Moderately Loaded = 0.355
Heavily Loaded = 0.666

Conclusion:

Not knowing the loaded/unloaded condition can equal a 3X error in life expectancy
Tools to gather Volume, Weight and Classification Data?
Tube counters
Weigh in Motion Station
Data Collection Framework

- Monitoring Sites
  - Continuous Counts
  - Short Term Counts

Volume Counts

- VOLUME COUNTS
- 50
- 5051
- 2299
- 245
- 31

Vehicle Classification (CVC)

- Truck Weight (WIM)
- 50

48 Hr. Volumes and Classification

- 48 Hr. Volumes

Cost

- $$$
Traffic

- Quality Control on WIM data
- Develop WIM input files
- Cluster analysis in identifying homogeneous traffic patterns.

- LTTP Plug program
  - Improved default traffic files
  - Improved user derived traffic data
Key Fact ..........

- The default data in ME Design is a great start

- A small amount of good data is better than a large amount of poor quality data.....

- Typically only 25% of WIM data is has been found to contain quality data.
Focus

• Information on most prevalent vehicles
• Overweight, permit vehicles
• Make it practical for design
  • Catalog traffic files
Questions ???
Florida Department of Transportation
Project Traffic Forecasting

NATMEC 2014
Classification Workshop
Steven Bentz
The Project Traffic Forecasting Handbook offers guidelines and techniques on the Design Traffic Forecasting Process, and supplements the **Project Traffic Forecasting Procedure**.

The PTF Handbook is a continuation of FDOT’s effort to develop an improved traffic forecasting procedure.

To standardize methodologies, a statewide survey of engineers and planners who produce or use traffic forecasts was conducted to determine the actual methods in use throughout the Districts.

A task team was formed to draft a compilation and explanation of the standardized design traffic forecasting methodologies.

The result was the Project Traffic Forecasting Handbook.

It represents a consensus approach to traffic forecasting.
The new PTF 101 training course is on-line and operational.

It is comprised of 17 modules which include a Fundamental Introduction, an Overview, and Basic, Advanced, and Assessment modules for Preservation, Operational Improvement, Capacity Improvement and New Alignment type projects.

The course can be simply viewed or users may enroll in order to receive a certificate upon successful completion and receive 16 PDH’s. The course numbers are:

**FDOT Course Number:** PE-04-0008  
**FBPE Course Number:** 0009291
PROJECT TRAFFIC FORECASTING (PTF)

The process to estimate traffic conditions used for determining the geometric design of a roadway and/or intersection and the number of 18-KIP ESALs that pavement will be subjected to over the design life.
Project Traffic Forecasting estimates are needed for Planning and Project Development and Environmental (PD&E) studies and construction plans which lead to construction, traffic improvements, and pavement design projects.

A Project Traffic Report is routinely developed as part of most Project Development and Environmental Studies.

FDOT’s Roadway Plans Preparation Manual requires Project Traffic and its major parameters to be posted on the Typical Section sheets.
Corridor projects usually require the development of travel projections which are used to make decisions which have important capacity and capital investment implications.

The traffic forecasting is required before establishing a new alignment or widening of an existing facility.
The Project Traffic projections are commonly used to develop laneage requirements for intersection designs, and to evaluate the operational efficiency of proposed improvements.

Project Traffic Forecasting is also required for reconstruction, resurfacing, adding lanes, bridge replacement, new roadway projects, and major intersection improvements.

This process differs from Corridor Traffic Forecasting in that it is site specific and covers a limited geographic area.
The Equivalent Single Axle Loading (ESAL) Forecasting Process is necessary for pavement design for new construction, reconstruction, or resurfacing projects.

Truck traffic and damage factors are needed to calculate axle loads expressed as ESALs.
The four major types of construction projects are:

• Preservation (resurfacing)
• Intersection Operational Improvements (add turns lanes)
• Roadway Capacity Improvements (add through lanes)
• New Alignment Projects.

Traffic operations projects such as signal timing, signal phasing and other non-construction type projects are not covered under this procedure.
Construction projects require both the Project Traffic Forecasting Process and the Equivalent Single Axle Load (ESAL) Process to be performed.

Preservation Projects, which are usually resurfacing projects, only require the ESAL process to determine the appropriate Load Equivalency Factor for the pavement to be laid.

Corridor Traffic Forecasting and Project Traffic Forecasting projects require forecasts of Annual Average Daily Traffic (AADT) and Design Hour Volumes (DHV).
TRUTH IN DATA PRINCIPLE

The goal of the principle is to provide the user with the information needed to make appropriate choices regarding the applicability of the forecast for particular purposes.

For the producer of the traffic forecast, it means clearly stating the input assumptions and their sources, and providing the forecast in a form that the user can understand and use.
TRAFFIC MONITORING SITES IN FLORIDA

Weight data provides damage factors used for pavement design.

1. Axle & seasonal correction factors
2. K, D, & T factors.

1. Seasonal correction factors
2. K & D factors.

PORTABLE TRAFFIC MONITORING SITES
TELEMETERED TRAFFIC MONITORING SITES

COVERAGE COUNT DATA

CLASSIFICATION

COUNT DATA

WIM

CLASSIFICATION

COUNT DATA

35 TTMSs

4146 PTMSs

12,416 PTMSs

300 TTMSs

214 TTMSs
STANDARD K FACTORS

FDOT has decided to replace the K30 factors with Standard K factors.

This has occurred because it has been widely recognized that roadways in urbanized areas cannot be cost effectively designed based on the 30th highest hour demand volumes.

Standard K factors have been established statewide by using the data measured at the continuous count sites.

The Standard K factors are based on area type and facility type with consideration to typical peak periods of the day.
## FDOT Standard K Factors

<table>
<thead>
<tr>
<th>Area (Population) [Examples]</th>
<th>Facility Type</th>
<th>Standard K Factors* (%AADT)</th>
<th>Representative Time Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Large Urbanized Areas with Core Freeways (1,000,000+) [Jacksonville, Miami]</td>
<td>Freeways</td>
<td>8.0 - 9.0 ***</td>
<td>Typical weekday peak period or hour</td>
</tr>
<tr>
<td></td>
<td>Arterials &amp; Highways</td>
<td>9.0**</td>
<td>Typical weekday peak hour</td>
</tr>
<tr>
<td>Other Urbanized Areas (50,000+) [Tallahassee, Ft. Myers]</td>
<td>Freeways</td>
<td>9.0 **</td>
<td>Typical weekday peak hour</td>
</tr>
<tr>
<td></td>
<td>Arterials &amp; Highways</td>
<td>9.0 **</td>
<td>Typical weekday peak hour</td>
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<tr>
<td>Transitioning to Urbanized Areas (Uncertain) [Fringe Development Areas]</td>
<td>Freeways</td>
<td>9.0</td>
<td>Typical weekday peak hour</td>
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<tr>
<td></td>
<td>Arterials &amp; Highways</td>
<td>9.0</td>
<td>Typical weekday peak hour</td>
</tr>
<tr>
<td>Urban (5,000-50,000) [Lake City, Key West]</td>
<td>Freeways</td>
<td>10.5</td>
<td>100th highest hour of the year</td>
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<tr>
<td></td>
<td>Arterials &amp; Highways</td>
<td>9.0 **</td>
<td>Typical weekday peak hour</td>
</tr>
<tr>
<td>Rural (&lt;5,000) [Chipley, Everglades]</td>
<td>Freeways</td>
<td>10.5</td>
<td>100th highest hour of the year</td>
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<tr>
<td></td>
<td>Arterials</td>
<td>9.5 **</td>
<td>100th highest hour of the year</td>
</tr>
<tr>
<td></td>
<td>Highways</td>
<td>9.5</td>
<td>100th highest hour of the year</td>
</tr>
</tbody>
</table>

* Some smoothing of values at area boundaries/edges would be desirable.

** Value is 7.5% in approved Multimodal Transportation Districts where automobile movements are deemphasized. Essentially, this lower value represents an extensive multi-hour peak period rather than a peak hour.

*** Value is 8.0% for FDOT-designated urbanized core freeways and may be either 8.5% or 9.0% for non-core freeways. Values less than 9% essentially represent a multi-hour peak period rather than a peak hour.
Project Traffic Forecasting Process

1. Begin
2. Establish Forecast Years
   - Step 1
   - Is Usable Corridor Traffic Available?
     - Step 2
     - Yes: Proceed to Step 3
     - No: Proceed to Step 4
   - Is Usable Traffic Available?
     - Step 2
     - Yes: Proceed to Step 3
     - No: Perform Historical Trend Analysis Projection
3. Obtain AADT, K, D, & T
   - Step 3
   - Obtain Turning Movement Counts
   - Determine PHF Using the Highway Capacity Manual Procedures
4. K & D Within Acceptable Range?
   - Step 4
   - Yes: Proceed to Step 5
   - No: Modify K & D
     - Step 4
     - Yes: Justify K & D
       - Step 4
       - No: Document the Variations
         - Step 4
         - Receive Approval for the Agreement
5. Develop Future Traffic Demand Volumes & Turning Movements
   - Step 5
6. Determine LOS
   - Step 6
   - Does Not Meet Standard
     - Step 6
     - Traffic Exceeds Capacity LOS Inadequate Section is "Constrained"
     - Exception
     - Obtain Exception to LOS Standard
   - Meets Standards
     - Step 6
     - Compile Draft Report
       - Step 7
       - Draft Report of "Exception Received"
       - Draft Report of Constrained Project
8. Schematic Diagrams of Project (AADT, DDHV, TMC, K, D, & T)
9. Send Report to Requester
The End

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(850) 414-4738
CLASSIFICATION

- Collection
- Quality Control
- Factoring
- Users of Data
- How we report
ATR Sites

- **Total - 111**
  - Classification - 66
  - Volume - 45

- **Types**
  - TRS - 97
  - WIM - 3
  - TIRTL - 11
COLLECTION

- Short Term Counts
  - District Staff
  - Consultant Contracts
ATR Sites

- Sites polled twice a week.
- Review numbers and look for issues and missing data.
- On our TIRTL sites, we also review the specific beam levels and angles, and current live status to see current traffic numbers.
- Review historical counts for SU & MU
- Look at traffic flow of current counts along route
- Drastic changes in AADT can warrant new breaks in count segments due to new traffic generators (New shopping centers, subdivisions, etc.)
Utilize monthly and day of week factors (Seasonal).
Broken down into 4 groups based on roadway type (Interstate/Other) and rural/urban classification.
Create growth factors based on last two years worth of data.
Seasonal factors are based on 4 year rolling average.
IDOT USERS OF DATA

- **AADT, SU & MU breakout** – used by Design & Bridges
- **AADT/VMT** – used by Traffic Safety and Safety Engineering when reviewing crash data.
- **AADT** – Planning uses during annual program cycle.
OTHER USERS OF DATA

- **AADT** - County, City, MPOs, Legislature, Governors office, researchers, businesses, etc. Many of these use for planning purposes, analysis patterns.
EXTERNAL WEBSITES

- [http://www.dot.il.gov/opp/planning.html#Transportation_Data](http://www.dot.il.gov/opp/planning.html#Transportation_Data)
- [http://www.gettingaroundillinois.com](http://www.gettingaroundillinois.com)
- [http://gis.dot.illinois.gov/gist2/](http://gis.dot.illinois.gov/gist2/)
- [http://idot.ms2soft.com/tcds/](http://idot.ms2soft.com/tcds/)

INTERNAL WEB SITE

- IRoads
Transportation Data

- FY 2013 Condition Rating Survey Summary Report
- Illinois Highway and Street Mileage Statistics
- Illinois Travel Statistics
- National Highway System (NHS) Statistics
- Illinois Highway Statistics Sheet
- Hourly Traffic Data
- FHWA Highway Statistics

Manuals

- Illinois Traffic Monitoring Program

Workshops, Conferences, Events, Training

- 2013 IDOT Fall Planning Conference
- 2013 IDOT Fall Planning Conference Presentations
- Division of Highways MYP Outreach Meeting Schedule
- Division of Highways MYP Outreach Meeting Summary of Comments

Partners

- FHWA (Federal Highway Administration)
- FTA (Federal Transit Administration)
- AMPO (Association of Metropolitan Planning Organizations)
http://www.gettingaroundillinois.com
IRoads
Michigan – our fit in the department
Classification data short term
Continuous vehicle classifications axle and weights
Equipment and sites configuration
Sites
Use of data
Limited length classification

NATMEC Classification Workshop
June 29, 2014  Sunday 9am-12 noon
$3$ Million Federal Aid

Operations/Safety
- Signals
- Stop signs
- Intersection improvements
- Speed limits
- Weight enforcement

Project Level Planning
- Traffic Analysis

Models
- Travel Demand Forecasting
- Air Quality

Traffic/Travel Information
- Public
- Gov. agencies
- Universities
- Private companies

Pavement
- Design
- Management

Legislative Analysis
- Revenue
- Size & weight

Multi-Modal
- Air
- Rail
- Bus

Michigan Department of Transportation
Short Term Class (13 bin hose, 3 bin video, 4 bin radar)

We don’t collect length classification data at our continuous count station (CCS) sites

State crew performs maintenance/upgrades

Contractors for new pavement installations

In-house monitoring suite of tools including polling program/traffic processing software

WIM analyst reviewing data/equipment weekly

Overview
State Crew – Repair and Upgrades
Sites selection

Collaboration for the placement of new WIM site installations and upgrades:

- Working with State Commercial Vehicle Enforcement, Transportation Planners and Pavement Design Teams

- Freight community and Third party vendors (PrePass and DriveWyze)
MEPDG research needs lead to new location WIM site recommendations.
Use 6 by 6 loops with 45 angles for counting (Phoenix)
15 Piezo BL for class (PAT)
41 Quartz WIM axle (PAT)
2 3M Micro loop Classifications

141 sites overall, of which 58 sites reporting class
Classification Data usage

Planning
  13 Bin, 3 bin, 4 bin for project,
  AADTT reporting, HPMS
  Air Quality
Overweight analysis
  Axle WIM data for enforcement strategies
  Truck Vehicle Registration/Policy
Axle and WIM
  Pavement Design
  PREP-ME inputs
  Bridge Loadings
  Commercial Vehicle Enforcement (Virtual WIM sites)
  PrePass and DriveWyze
Project and future plans
  Equivalent Single Axle Load (ESAL)
Class data to MPO’s

Software issues include needed upgrades
Loop- and Length-Based Vehicle Classification, Federal Highway Administration – Pooled Fund Program [TPF-5(192)]
Vehicle length issues

Overlapping or gray areas with types vehicles
Axle based (WIM) for Enforcement
Length (accuracy issues using defaults) for Pavement Design
MOVES (Air Quality)
Information provided to:
  MDOT staff and other state agencies
  FHWA
  MPO’s and RPO’s
  Public/Consultants
  Researchers (weights, truck parking, pavement design, bridge design)

Michigan Axle Loadings
Michigan has a unique system of truck-weight law based on maximum axle loadings, not gross vehicle weight (GVW). Gross vehicle weight includes the weights of the truck, cargo, fuel, and driver; axle loading is the weight on a single axle. Maximum allowable axle loadings are the same for a standard truck in all states, but Michigan allows use of more axles in combination with lower axle loadings, for a greater gross vehicle weight than other states.

Michigan Axle Loading
The maximum gross vehicle weight allowed on a “federal-weight-law truck” is 80,000 pounds, with four of its five axles carrying 17,000 pounds each and the steering axle carrying 12,000 pounds.

The maximum allowable gross vehicle weight on the heaviest “Michigan-weight-law truck” is 164,000 pounds, which can only be achieved by use of eleven properly-spaced axles. Most of these axles carry only 13,000 pounds each.
Most of these axles carry only 13,000 pounds each. The alternative to a single Michigan combination carrying 160,000 lbs. on 11 axles is two standard trucks carrying 160,000 lbs. on 10 axles.

Michigan’s axle loading system has a critical dependence with the FHWA Scheme F classification criteria.
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For More information:

Lawrence Whiteside
Travel Information Unit, Asset Management Division
Michigan Department of Transportation
whitesidel@michigan.gov
Phone: 517-373-2272
www.michigan.gov\adtmaps
www.michigan.gov\mdot-tmis
Using Vehicle Class Data for Pavement Deterioration and Other Purposes

Roger D. Mingo, P.E.
R.D. Mingo and Associates
People Interested in Class Data

• **Data Providers**—Collectors and Compilers Who Strive Constantly for More and Better Data

• **Data Users**—Analyze Trends, Plan Highways, or Formulate Policies Based on Trends
People Interested in Class Data

- **Data Providers**—Collectors and Compilers Who Strive Constantly for More and Better Data
- **Data Users**—Analyze Trends, Plan Highways, or Formulate Policies Based on Trends
- **Data Dabblers**—Every So Often, Gather and Analyze as Much Data as Possible for Some Specific Purpose
Examples of Why We Dabble

• **Highway Cost Allocation (HCAS)**—How much highway resource does each class of highway user consume?

• **Truck Size and Weight (TSW) Policy**—If we allow bigger trucks / heavier trucks / heavier axle loads, what happens to our highways and highway users?
Simple Questions, Simple Needs

• **Travel by Vehicle Class**—Typical HCAS or TSW studies need more than 13 vehicle classes.

• **Vehicles on Various Highway Types**—Vehicles have different travel patterns and impacts on different types of highways.

• **Vehicle Weights and Axle Weights**—Pavement, bridge, and interference impacts vary by vehicle weight, axle weights, and axle spacings.
Bottom Line: Insatiable Demand

• **VMT Array Needed**—Travel by 28 vehicle classes, 12 highway classes, and 51 states / colonies

• **More Detail**—Break down vehicle class travel by 100 operating weight groups, and develop a characteristic array of 120 axle weights / types for each

• **Quality Compromise**—Better data allows better analysis, and therefore better decisions.
Path from VM1 and VM2 Tables

- **VM2 Tables**— Contain FHWA estimates of travel by all vehicles in each state and highway type
- **Classification Data**— If complete and accurate, would get us half way to the large VMT array we need
- **WIM Data**— Allows finer breakdown of vehicle types and provides operating weight and axle weight details
Role of Class Data

• **More Detail than Counts**—Traffic counts alone provide limited value to studies of trucks.

• **More Spatial Coverage than WIM**—In the latest (December 2013) sweep of data compiled by FHWA, we got nearly 2400 class stations, only 451 WIM stations (plus 19 LTPP WIM stations).

• **Can Work with WIM**—Weights of axles, combined with spacings, provide opportunity for improved classification accuracy.
Limitations of Class Data

• **Difficult to Compile and Extract**—VTRIS, TMAS, dbf formats, file name variety

• **Incomplete Coverage**—2400 compiled class stations cover only 220 of cells in the state / functional-class (612 needed)

• **High Error Rate for Some Classes**—Catchall class 13 has been a historic problem (better, though, when class 14 is used)
Improvements?

• 13 Classes?— Get rid of “catchall classes”. Don’t overreach.

• Aggregate / Disaggregate?— Maybe, but much value comes from the raw data

• Length Based?— What else is there?

• Critical Needs of Dabbler Community?— More data, more accessibility, more housekeeping
2014 NATMEC Conference – Classification Workshop
Scott Petersen, P.E.
June 29, 2014
Project Team

- Gene Hicks, Mn/DOT Project Manager
- Steven Jessberger, FHWA
- Erik Minge, SRF Consulting Group
- Scott Petersen, SRF Consulting Group
- Herb Weinblatt, Cambridge Systematics
- Benjamin Coifman, Ohio State University
- Earl Hoekman, EL Enterprises
Participating Agencies/TAC

- Maryann Dierckman, Alaska
- Aaron Moss, Colorado
- Anne-Marie McDonnell, Connecticut
- Steven Bentz, Florida
- Jack Helton, Idaho
- Rob Robinson, Illinois
- Jim Kramer, Michigan
- Gene Hicks, Minnesota
- Kurt Matias, New York
- Dave Gardner and Lindsey Pflum, Ohio
- Andrea Bahoric, Pennsylvania
- Bill Knowles, Texas
- Ken Lakey, Washington
- John Williamson, Wisconsin
- Mark Wingate, Wyoming
Literature Review

• Loop Characteristics
• Loop Detector Errors
• Length Classification Issues
• Inductive Signature-Based Detectors
• Non-Loop Detectors
• Uses for Length-Based Classification
## Traditional Classification Method

### FHWA 13 Class Scheme

<table>
<thead>
<tr>
<th>FHWA Vehicle Classifications</th>
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<tbody>
<tr>
<td><strong>1. Motorcycles</strong>&lt;br&gt;2 axles, 2 or 3 tires</td>
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<tr>
<td><img src="image" alt="Motorcycle" /></td>
</tr>
<tr>
<td><strong>3. Pickups, Panels, Vans</strong>&lt;br&gt;2 axles, 4-tire single units&lt;br&gt;Can have 1 or 2 axle trailers</td>
</tr>
<tr>
<td><img src="image" alt="Pickup" /></td>
</tr>
<tr>
<td><strong>5. Single Unit 2-Axle Trucks</strong>&lt;br&gt;2 axles, 6 tires (dual rear tires), single-unit</td>
</tr>
<tr>
<td><img src="image" alt="Single Unit 2-Axle Truck" /></td>
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<tr>
<td><strong>7. Single Unit 4 or More-Axle Trucks</strong>&lt;br&gt;4 or more axles, single unit</td>
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<td><img src="image" alt="Single Unit 4 or More-Axle Truck" /></td>
</tr>
<tr>
<td><strong>9. Single Trailer 5-Axle Trucks</strong>&lt;br&gt;5 axles, single trailer</td>
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<td><strong>11. Multi-Trailer 5 or Less-Axle Trucks</strong>&lt;br&gt;5 or less axles, multiple trailers</td>
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<tr>
<td><strong>13. Multi-Trailer 7 or More-Axle Trucks</strong>&lt;br&gt;7 or more axles, multiple trailers</td>
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</table>
Proposed Length Bins
What length thresholds should be used?

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<th>LBVC Scheme</th>
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# Proposed Length Bins

What length thresholds should be used?

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Axle Classes:
- MC: Medium Combination
- S: Single
- M: Medium
- ML: Medium Long
- L: Long
- VL: Very Long
- A: A
- LT: LT
- 3T, 5-7: 3T, 5-7
- 8-12: 8-12
- 13: 13
Vehicle Length Distribution by Class
**Proposed Length Bins**

**What length thresholds should be used?**

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- **Motorcycles**
- **Autos/Light Trucks**
- **Autos with Trailers/Single Unit Trucks**
- **Multi-Unit Trucks**
Proposed Length Bins
What length thresholds should be used?

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<th>Autos/Light Trucks</th>
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<th>Autos with Trailers/Single Unit Trucks</th>
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</table>

- MC: 6.75 feet
- S: 22 feet
- M: 49 feet
- L: ? (85 feet?)
- VL: ? (85 feet?)

Images of vehicle classifications include:
- Rocky Mountain Double: 45' - 48'
- Turnpike Double: 45' - 48'
- Triple: 26' - 28'

**Note:** The classification for 85 feet is speculative and requires further validation.
Length Classes MC and S
Threshold Results – LTPP Data

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<td>365</td>
<td>2,047,028</td>
<td>0</td>
<td>0</td>
<td>2,047,393</td>
<td>2,647,020</td>
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<tr>
<td></td>
<td></td>
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<td>100.0%</td>
<td>0.0%</td>
<td>0.0%</td>
<td>100.0%</td>
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</tr>
<tr>
<td>3</td>
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<td>0</td>
<td>576,945</td>
<td>22,683</td>
<td>0</td>
<td>599,627</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>0.0%</td>
<td>96.2%</td>
<td>3.8%</td>
<td>0.0%</td>
<td>100.0%</td>
<td></td>
</tr>
</tbody>
</table>
### Length Class M

#### Threshold Results – LTPP Data

<table>
<thead>
<tr>
<th>Axle Class</th>
<th>MC</th>
<th>S</th>
<th>M</th>
<th>L</th>
<th>Total</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>2T</td>
<td>0</td>
<td>460</td>
<td>23,820</td>
<td>114</td>
<td>24,393</td>
<td>100.0%</td>
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<tr>
<td>0.0%</td>
<td>1.9%</td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3T</td>
<td>0</td>
<td>34</td>
<td>66,975</td>
<td>8,315</td>
<td>75,323</td>
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<tr>
<td>0.0%</td>
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<td></td>
<td></td>
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<td>4</td>
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<td>1</td>
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<td>12,250</td>
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<td></td>
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<tr>
<td>5</td>
<td>0</td>
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<td>68,682</td>
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<td>0.0%</td>
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<td></td>
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<td>5T</td>
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<td>1</td>
<td>11,130</td>
<td>6,005</td>
<td>17,135</td>
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<tr>
<td>6</td>
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<td>34</td>
<td>26,463</td>
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<tr>
<td>7</td>
<td>0</td>
<td>41</td>
<td>4,951</td>
<td>7</td>
<td>4,998</td>
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<tr>
<td>0.0%</td>
<td>0.8%</td>
<td></td>
<td></td>
<td></td>
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</table>

Total: 250,991
Length Class L
Threshold Results – LTPP Data

<table>
<thead>
<tr>
<th>Axle Class</th>
<th>MC</th>
<th>S</th>
<th>M</th>
<th>L</th>
<th>Total</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>0</td>
<td>1</td>
<td>9,982</td>
<td>35,133</td>
<td>45,116</td>
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</tr>
<tr>
<td></td>
<td>0.0%</td>
<td>0.0%</td>
<td>22.1%</td>
<td>77.8%</td>
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<td></td>
</tr>
<tr>
<td>9</td>
<td>0</td>
<td>0</td>
<td>4,946</td>
<td>997,264</td>
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<td>99.5%</td>
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<td></td>
</tr>
<tr>
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<td>0</td>
<td>0</td>
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<td>10,003</td>
<td>10,319</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>3.1%</td>
<td>96.9%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>52,263</td>
<td>52,263</td>
<td>100.0%</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>23,923</td>
<td>23,923</td>
<td>100.0%</td>
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<td>0.0%</td>
<td>0.0%</td>
<td>100.0%</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>0</td>
<td>0</td>
<td>104</td>
<td>2,468</td>
<td>2,572</td>
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<td>0.0%</td>
<td>4.0%</td>
<td>96.0%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Total: 1,136,402
Field Test: How Accurate Are Length-Based Sensors?

- Detector Model
- Loop shape
  - 6’x6’
  - 6’x8’
  - Quadrupole
  - “Blade” Loop
- Loop lead-in length
I-35 Test Site Loop Layout (Wyoming, MN)
# Field Test - Detectors

## Loop Detectors

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diamond</td>
<td>Phoenix I</td>
</tr>
<tr>
<td>Diamond</td>
<td>Phoenix II</td>
</tr>
<tr>
<td>GTT</td>
<td>Canoga C944</td>
</tr>
<tr>
<td>IRD</td>
<td>TCC-540</td>
</tr>
<tr>
<td>IRD</td>
<td>TRS</td>
</tr>
<tr>
<td>PEEK</td>
<td>ADR 3000</td>
</tr>
</tbody>
</table>

## Non-Loop Detectors

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>GTT</td>
<td>Canoga Microloops (C944 Card)</td>
</tr>
<tr>
<td>Vaisala/Nu-Metrics</td>
<td>Hi-Star NC200 ION</td>
</tr>
<tr>
<td>Vaisala/Nu-Metrics</td>
<td>Hi-Star NC300</td>
</tr>
<tr>
<td>Wavetronix</td>
<td>SmartSensor HD</td>
</tr>
</tbody>
</table>
Field Test - Detectors

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diamond</td>
<td>iLoop</td>
</tr>
<tr>
<td>IST</td>
<td>IST-222</td>
</tr>
<tr>
<td>PEEK</td>
<td>ADR 6000</td>
</tr>
</tbody>
</table>
Video Ground Truth

- High-resolution video screenshots
- Pixel-measurement
- Average absolute error 0.43 ft
- Errors generally within one foot
Loop Detector Field Test Results
Length and Speed

Diamond Phoenix II - 6x6 Loop

PEEK ADR 3000
## Loop Detector Field Results

Normal Lead-In (200’-300’)

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>6’x6’ loops (feet)</th>
<th>6’x8’ loops (feet)</th>
<th>Quadrupoles (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diamond</td>
<td>Phoenix I</td>
<td>1.24</td>
<td>1.79</td>
<td>3.5</td>
</tr>
<tr>
<td>Diamond</td>
<td>Phoenix II</td>
<td>1.74</td>
<td>1.09</td>
<td>Not Tested</td>
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<tr>
<td>GTT</td>
<td>Canoga C944</td>
<td>1.98</td>
<td>1.85</td>
<td>3.4</td>
</tr>
<tr>
<td>IRD</td>
<td>TCC-540</td>
<td>1.31</td>
<td>1.42</td>
<td>3.9</td>
</tr>
<tr>
<td>IRD</td>
<td>TRS</td>
<td>1.64</td>
<td>1.44</td>
<td>Did Not Function</td>
</tr>
<tr>
<td>PEEK</td>
<td>ADR 3000</td>
<td>1.34</td>
<td>2.05</td>
<td>3.8</td>
</tr>
</tbody>
</table>
## Loop Detector Field Results

### Long Lead-In (1,500’)

<table>
<thead>
<tr>
<th>Manufacturer</th>
<th>Model</th>
<th>Average Absolute Length Error (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diamond</td>
<td>Phoenix I</td>
<td>0.97</td>
</tr>
<tr>
<td>Diamond</td>
<td>Phoenix II</td>
<td>1.18</td>
</tr>
<tr>
<td>GTT</td>
<td>Canoga C944</td>
<td>1.41</td>
</tr>
<tr>
<td>IRD</td>
<td>TCC-540</td>
<td>1.51</td>
</tr>
<tr>
<td>IRD</td>
<td>TRS</td>
<td>Not Tested</td>
</tr>
<tr>
<td>PEEK</td>
<td>ADR 3000</td>
<td>1.80</td>
</tr>
</tbody>
</table>
## Inductive Signature Detector Results

<table>
<thead>
<tr>
<th>Manufacturer/Model</th>
<th>Loop Configuration Tested</th>
<th>Average Absolute Error (feet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diamond iLoop</td>
<td>6’x6’ Loops</td>
<td>1.61</td>
</tr>
<tr>
<td>IST IST-222</td>
<td>6’x6’ Loops</td>
<td>1.32</td>
</tr>
<tr>
<td>PEEK ADR 6000</td>
<td>6’x6’/Quadrupole Combination</td>
<td>1.36</td>
</tr>
</tbody>
</table>
Laboratory Test Objectives

- Determine repeatability of detector data
- Directly compare detector results with same vehicle signatures
Laboratory Results - Length

- Average Absolute Error (ft)
- ADR3000
- GTT C924
- Phoenix I
- Phoenix II
- TCC-540
- TRS

<table>
<thead>
<tr>
<th>Category</th>
<th>ADR3000</th>
<th>GTT C924</th>
<th>Phoenix I</th>
<th>Phoenix II</th>
<th>TCC-540</th>
<th>TRS</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Vehicles</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axle Class 1</td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Axle Classes 2-3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Axles Classes 4-7</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Laboratory Results - Speed

[Graph showing average absolute error in mph for different categories of vehicles and axle classes.]
Calibration Procedure
Probe Vehicle Selection and Procedure
Conclusions

• Length classification is less precise than classification by axle spacing and/or weight

• Significant overlap between lengths among various axle classes
  – Passenger vehicles with trailers classified as Medium
  – Selected length scheme thresholds designed to balance misclassification
Conclusions

• When calibrated, loop detectors report accurate vehicle lengths
  – Average absolute error less than two feet across all vehicles

• Calibration is an important step
  – Select a calibration vehicle that has a magnetic length that is close to the physical length (auto, semi w/lowboy)

• 6’x6’ and 6’x8’ loops offer excellent length detection performance and should continue to be installed
  – Benefit to motorcycle detection with 6’x8’ loops
Contact

Scott Petersen, SRF Consulting Group
spetersen@srfconsulting.com

Gene Hicks, Mn/DOT Project Manager,
gene.hicks@state.mn.us

Erik Minge, SRF Consulting Group
eminge@srfconsulting.com

Herb Weinblatt, Cambridge Systematics
hweinblatt@camsys.com
2014 NATMEC Classification Workshop

June 29, 2014
Chicago, IL
Overview Class Data Collection, Usage and Issues

NATMEC 2014
Improving Traffic Data Collection, Analysis, and Use

Tianjia Tang, PE, Ph.D.
Chief, Travel Monitoring and Surveys Division
Office of Highway Policy Information, Federal Highway Administration
Tianjia.Tang@DOT.GOV
Objective

1) To review whether the current system still meets the needs,
2) How to take advantage of current data capturing technology,
3) What new technology and policy program and initiatives both the private and public sectors should focus on.
<table>
<thead>
<tr>
<th>Class 1</th>
<th>Motorcycles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Class 2</td>
<td>Passenger cars</td>
</tr>
<tr>
<td>Class 3</td>
<td>Four tire, single unit</td>
</tr>
<tr>
<td>Class 4</td>
<td>Buses</td>
</tr>
<tr>
<td>Class 5</td>
<td>Two axle, six tire, single unit</td>
</tr>
<tr>
<td>Class 6</td>
<td>Three axle, single unit</td>
</tr>
<tr>
<td>Class 7</td>
<td>Four or more axle, single unit</td>
</tr>
<tr>
<td>Class 8</td>
<td>Four or less axle, single trailer</td>
</tr>
<tr>
<td>Class 9</td>
<td>5-Axle tractor semitrailer</td>
</tr>
<tr>
<td>Class 10</td>
<td>Six or more axle, single trailer</td>
</tr>
<tr>
<td>Class 11</td>
<td>Five or less axle, multi trailer</td>
</tr>
<tr>
<td>Class 12</td>
<td>Six axle, multi-trailer</td>
</tr>
<tr>
<td>Class 13</td>
<td>Seven or more axle, multi-trailer</td>
</tr>
</tbody>
</table>
Data Reported to FHWA

I. **HPMS** - 6 Vehicle Groups:
   MC, Bus, LD-SWB, LD-LWB, SUV, and CT

2. **WIM** – all 13 Vehicle Types

3. **Volume** – 1

4. **Class** – 13 vehicle types
FHWA Usage

• Fund Apportionment – actual apportionment and legislative scenario analysis
• Safety analysis
• Cost allocation analysis
• Trending analysis
• Fuel consumption
• Greenhouse gas emission
• Fuel efficiency
• Others
Highway Noise Modeling

Five vehicle types

1. automobiles,
2. medium trucks,
3. heavy trucks,
4. buses,
5. motorcycles
# Air Quality Modeling

## EPA’s MOVES Model

<table>
<thead>
<tr>
<th>SourceType ID</th>
<th>SourceType</th>
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</thead>
<tbody>
<tr>
<td>11</td>
<td>Motorcycles</td>
</tr>
<tr>
<td>21</td>
<td>Passenger Cars</td>
</tr>
<tr>
<td>31</td>
<td>Passenger Trucks (primarily personal use)</td>
</tr>
<tr>
<td>32</td>
<td>Light Commercial Trucks (other use)</td>
</tr>
<tr>
<td>41</td>
<td>Intercity Buses (non-school, non-transit)</td>
</tr>
<tr>
<td>42</td>
<td>Transit Buses</td>
</tr>
<tr>
<td>43</td>
<td>School Buses</td>
</tr>
<tr>
<td>51</td>
<td>Refuse Trucks</td>
</tr>
<tr>
<td>52</td>
<td>Single Unit Short-haul Trucks</td>
</tr>
<tr>
<td>53</td>
<td>Single Unit Long-haul Trucks</td>
</tr>
<tr>
<td>54</td>
<td>Motor Homes</td>
</tr>
<tr>
<td>61</td>
<td>Combination Short-haul Trucks</td>
</tr>
<tr>
<td>62</td>
<td>Combination Long-haul Trucks</td>
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</table>
Air Quality Modeling

<table>
<thead>
<tr>
<th>SourceType ID</th>
<th>SourceType</th>
<th>HPMS Vehicle Class</th>
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<tbody>
<tr>
<td>11</td>
<td>Motorcycles</td>
<td>Motorcycles</td>
</tr>
<tr>
<td>21</td>
<td>Passenger Cars</td>
<td>Passenger Cars</td>
</tr>
<tr>
<td>31</td>
<td>Passenger Trucks (primarily personal use)</td>
<td>Other Two-Axle/Four Tire, Single Unit</td>
</tr>
<tr>
<td>32</td>
<td>Light Commercial Trucks (other use)</td>
<td>Other Two-Axle/Four Tire, Single Unit</td>
</tr>
<tr>
<td>41</td>
<td>Intercity Buses (non-school, non-transit)</td>
<td>Buses</td>
</tr>
<tr>
<td>42</td>
<td>Transit Buses</td>
<td>Buses</td>
</tr>
<tr>
<td>43</td>
<td>School Buses</td>
<td>Buses</td>
</tr>
<tr>
<td>51</td>
<td>Refuse Trucks</td>
<td>Single Unit</td>
</tr>
<tr>
<td>52</td>
<td>Single Unit Short-haul Trucks</td>
<td>Single Unit</td>
</tr>
<tr>
<td>53</td>
<td>Single Unit Long-haul Trucks</td>
<td>Single Unit</td>
</tr>
<tr>
<td>54</td>
<td>Motor Homes</td>
<td>Single Unit</td>
</tr>
<tr>
<td>61</td>
<td>Combination Short-haul Trucks</td>
<td>Combination</td>
</tr>
<tr>
<td>62</td>
<td>Combination Long-haul Trucks</td>
<td>Combination</td>
</tr>
</tbody>
</table>
Transportation Demand Modeling

System wide – POV, bus and truck most likely

Project level – may be as “automobiles, medium trucks, heavy trucks, buses, and motorcycles.”
Roadway Geometric Design

- # of lane - volume only
- Lane width – POV and truck %
- Horizontal curvature – volume only and design vehicle
- Vertical curve – % of truck only.
Roadway Pavement Design


• **Asphalt Institute Handbook** – same as AASHTO

• **AASHTO Mechanistic and Empirical Design** – FHWA 13 vehicle types
Bridge Design (2 types)

Standard Specifications for Highway Bridges AASHTO - three types of design vehicles loads.

1: H Truck - two axle 20-ton configuration and 15 – ton Configuration

2: HS Truck - conventional semi- or tractor-trailer vehicle

3: String arrangement vehicle groups
Pavement/Bridge Deterioration Analysis

No fixed number of vehicle categories. In theory, the more class, and the more class with both axle weight and gross vehicle weight, the more precise correlations can be drawn.
New Phenomena TPF5192 MN DOT Pool Fund Study

Vehicle Length by Axle Classification
What We Should Do
Overview of Wisconsin’s Continuous Count Program
### STATE OF WISCONSIN PROFILE

<table>
<thead>
<tr>
<th>System</th>
<th>Miles</th>
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<tbody>
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<td>Interstate</td>
<td>743</td>
</tr>
<tr>
<td>PA Freeway Expressway</td>
<td>573</td>
</tr>
<tr>
<td>PA Other</td>
<td>4903</td>
</tr>
<tr>
<td>Minor Arterial</td>
<td>7436</td>
</tr>
<tr>
<td>Major Collector</td>
<td>14879</td>
</tr>
<tr>
<td>Minor Collector</td>
<td>8621</td>
</tr>
<tr>
<td>Local</td>
<td>77,990</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>115,145</strong></td>
</tr>
</tbody>
</table>

Local / County Roads = 100,000+ miles

---

Local Government Jurisdictions
State of Wisconsin

- County: 72
- City: 190
- Village: 400
- Town: 1,260

Wisconsin Department of Transportation
**Data Management Section**

**Bureau of State Highway Programs**

**Roadway and Traffic Data Programs**

Administer Statewide Policy and Guidelines for Roadway Data

Meet Federal & State Mandates

Process | Share Linework and Data

Submit Roadway Data to Federal Highways

---

**Traffic (Central Ofc)**
- Continuous Short-Term WIM Policy & Processing

**Field Ops**
- Continuous Traffic Data Collection
- Maintenance and Installation

**HPMS**

**State Highway (STN)**

**Local Roads (WISLR)**

Wisconsin Department of Transportation
## WIsDOT Traffic Data Staffing Levels

<table>
<thead>
<tr>
<th>Central Office</th>
<th>Field Operations</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Responsibilities</strong></td>
<td><strong>Responsibilities</strong></td>
</tr>
<tr>
<td>o Administer Policy and Federal Guidelines</td>
<td>o Maintain ATR Sites</td>
</tr>
<tr>
<td>o Oversee Contracts, Budgets</td>
<td>o Oversee Installation ATR and WIM Sites</td>
</tr>
<tr>
<td>o Process Continuous, Video, Short-Duration, WIM, and Special Counts</td>
<td>o Maintain Short-Term Equipment</td>
</tr>
<tr>
<td><strong>Staffing Level</strong></td>
<td><strong>Staffing Level</strong></td>
</tr>
<tr>
<td>o 4 Full Time Employees</td>
<td>o 2 Full Time Employees</td>
</tr>
<tr>
<td>o 1 Seasonal Employee</td>
<td>o 1 Seasonal Employee</td>
</tr>
</tbody>
</table>

Wisconsin Department of Transportation
## WisDOT Traffic Program Overview

### Installation / Maintenance
- **Equipment**
  - Wavetronix
  - Diamond
  - Peek
  - Timemark (S-T)

- **Communications**
  - Data Remote
  - Sierra

- **Contract Oversight**

### Data Collection
- **Short-Term**
  - 3-6-10 Cycle
  - (Even/Odd)
  - Download – VIAS

- **Continuous**
  - 24/7 – 365 Days/yr

- **WIM**

- **Specials**
  - Upon Request

### Production Processing
- **Autopolling**
  - Datacollector
  - Centurion
  - Viper

- **TRADAS Process**
  - Daily
  - Troubleshoot
  - Reprocessing
  - Monthly
  - Annual

- **Quality Control**
  - Preliminary AADT to Prior Final AADT
  - Corridor
  - TRADAS Edits

### Outputs
- **Federal**
  - TMAS
  - HPMS

- **Internal**
  - Local Road System
  - Forecasting VMT
  - Pavement Design
  - Hwy Programming
  - Regional Planners
  - Safety Engineers

- **External**
  - Tribal
  - MPOs
  - RPCs
  - Public
  - Consultants

---

Wisconsin Department of Transportation
% Change report

Wisconsin Department of Transportation

% Change for Counts Taken between 06/13/2013 and 06/13/2014

<table>
<thead>
<tr>
<th>Region</th>
<th>County</th>
<th>Station ID</th>
<th>Count Cycle</th>
<th>Location</th>
<th>Cut Date</th>
<th>CAADT</th>
<th>Prev Yr</th>
<th>Prev AADT</th>
<th>Pct Chg</th>
</tr>
</thead>
<tbody>
<tr>
<td>SW</td>
<td>La Crosse</td>
<td>321000</td>
<td>A-62-VMA</td>
<td>CTH DH BTWN CTH HD &amp; CTH V HOMEN</td>
<td>5/19/14</td>
<td>362</td>
<td>2011</td>
<td>3700</td>
<td>-90.22</td>
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<tr>
<td>SW</td>
<td>La Crosse</td>
<td>322002</td>
<td>A-3-V-HPMS</td>
<td>ENTERPRISE AVEN W 0C COMMERCE ST ONALASKA - HPMS</td>
<td>6/2/14</td>
<td>1557</td>
<td>2011</td>
<td>8232</td>
<td>-91.69</td>
</tr>
</tbody>
</table>

GIS – PLOTTING (corridor)

PROCESS DOCUMENTATION

Bureau of State Highway Programs
Data Management Section

Process Documentation
Traffic Data System (TRADAS)
WisDOT Continuous Axle & Length Schemes

FHWA (axle) | WisDOT Length | HPMS (axle)
---|---|---
1 (MC) | BIN 1 | 1 (MC)
2 (PC) | BIN 2 | 2 (PV)
3 (SU2-4) | BIN 3 | 3 (LT)
4 (BUSES) | BIN 4 | 4 (BUS)
5 (SU2-6) | BIN 5 | 5 (SU)
6 (SU3) | | 6 (CU)
7 (SU4+) | | |
8 (ST4-) | | |
9 (ST5) | | |
10 (ST6+) | | |
11 (MU5-) | | |
12 (MU6) | | |
13 (MU7+) | | |

Wisconsin Department of Transportation
TRADAS Annual Processing

1.0 Phase I
Compute AADT for Continuous Sites

2.0 Phase II
Generate and Apply All Factors To AADT values generated from Phase I

3.0 Phase III
Recompute and Apply Factors To Short-Duration Counts Collected for that Year

4.0 Phase IV
Copy AADT Values from RR to RR.Net Using Phase I & III Outputs

This Step is executed by Vendor Output from Phase IV as input for HPMS
This step applies growth factors to non-collected S-T counts sites

Traffic file for HPMS

Wisconsin Department of Transportation
Reporting Of WisDOT Traffic Data

MONTHLY

TMAS
REGION REPORTS

Quarterly

TAFIS
Meta

ANNUAL

RR WEB (short-term)
Continuous Count Data
HPMS
WISLR (LR)
CLASSIFICATION BOOK

Wisconsin Department of Transportation
WisDOT Continuous Count Program

Current View of Axle to Length Percent Comparison

206 ATR Sites

- 32 axle (16%)
- 174 length (84%)

2016 Axle to Length Percent Comparison

252 ATR

- 78 axle (31%)
- 174 length (69%)

Wisconsin Department of Transportation
### Axle to Length Cost Comparison

<table>
<thead>
<tr>
<th>Type of Station</th>
<th>Average COST Install New 4-lane Site</th>
<th>Total</th>
<th>Net Difference</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axle</td>
<td>Contract Install</td>
<td>Materials</td>
<td>Recorder</td>
</tr>
<tr>
<td></td>
<td>$24,000</td>
<td>$9,000</td>
<td>$2,200</td>
</tr>
<tr>
<td>Length</td>
<td>$7,000</td>
<td>$5,900</td>
<td>$5,400</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type of Station</th>
<th>Average REPAIR COST 4-lane Site</th>
<th>Total Net Diff Install + Maint Per Site</th>
</tr>
</thead>
<tbody>
<tr>
<td>Axle</td>
<td>Contract / DOT Maint</td>
<td>Materials</td>
</tr>
<tr>
<td></td>
<td>$21,500</td>
<td>$3,600</td>
</tr>
<tr>
<td>Length</td>
<td>$500</td>
<td>$250</td>
</tr>
</tbody>
</table>

**Axle**
- Higher resolution (MC, Cars, Pickups, etc)
- Higher installation and maintenance costs
  - Lane closures
  - Timeliness of maintenance

**Length**
- Lower resolution (Passenger, Single-Unit, Combos)
- Lower installation and maintenance costs
  - Non-intrusive technologies reduce costs
  - Very few maintenance needs
Steps To Tune Continuous Count Program
Commitment to Quality Traffic Data

1. FHWA TMG Training
   • Wisconsin Hosted: Iowa, Minnesota, Kansas
   • *July 2013, La Crosse, Wisconsin*

2. Contract with industry traffic data expert
   • Analyze Wisconsin’s Length to Axle data
   • Recommendations to fine tune

3. Review Traffic Program
   • Increase Axle / Length Ratio: 31% / 69%
   • By 2016 78 Axle / 174 Length

Wisconsin Department of Transportation
HOW GOOD ARE MY DATA?

WISCONSIN DOT CASE STUDY AND FINDINGS:

“UNDERSTANDING THE SIGNIFICANCE OF CLASS VERSUS LENGTH ON AXLE FACTORS AND ITS EFFECT ON AADT TO ENSURE RELIABLE TRAFFIC DATA”