

Traffic Data Resources for Transportation Modeling

Kent Taylor, State Traffic Survey Engineer

October 30, 2012

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Traffic Monitoring System

Mandated under ISTEA (1991):

- Performed at the state level to support a nationwide system
- Required to meet Highway Performance Monitoring System standards

Traffic Survey manages this system

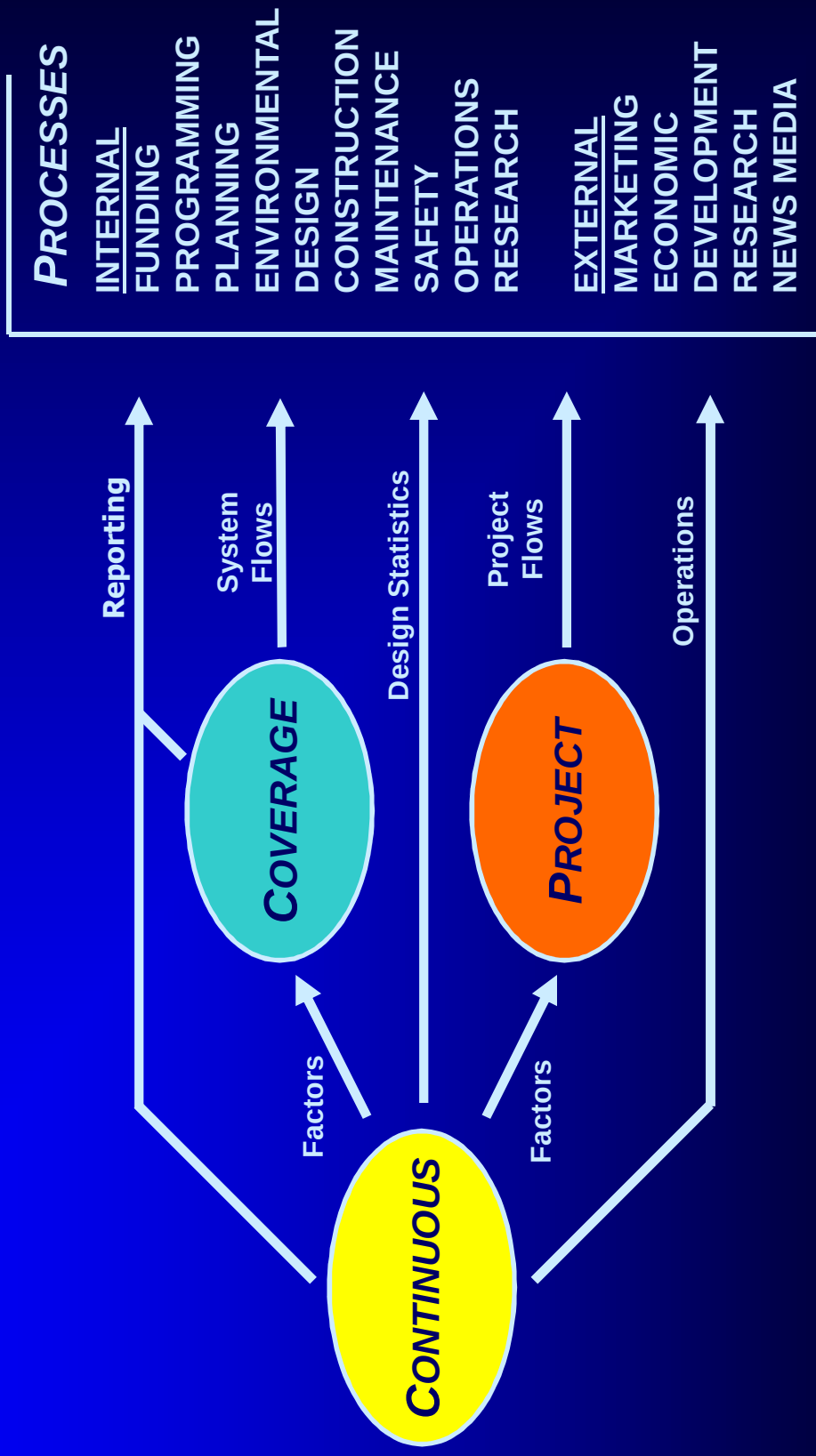
Traffic Monitoring System

TMS is comprised of 3 programs:

- Continuous Count
- Coverage Count
- Project Count

Each provides specific resources

TRAFFIC MONITORING SYSTEM





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TRAFFIC MONITORING SYSTEM

The three data programs encompass a variety of data types:

CONTINUOUS COUNT PROGRAM

**Volume – Automatic Traffic Recorder (ATR)
Vehicle Classification – Automatic Vehicle Classifier (AVC)
Vehicle Weight – Weigh In Motion (WIM)**

COVERAGE COUNT PROGRAM

**Volume - Portable Traffic Counter (PTC)
Vehicle Classification – Portable Vehicle Classifier (PVC)**

PROJECT COUNT PROGRAM

**General Projects - Daily, Hourly, Class, Turning Movement, Manual Class
Major Projects - Model Validation Counts, Research Studies**

The Traffic Monitoring Guide (FHWA) and the Guide for Traffic Data Programs (AASHTO) provide the guidelines, procedures, and standards for our traffic monitoring activities.

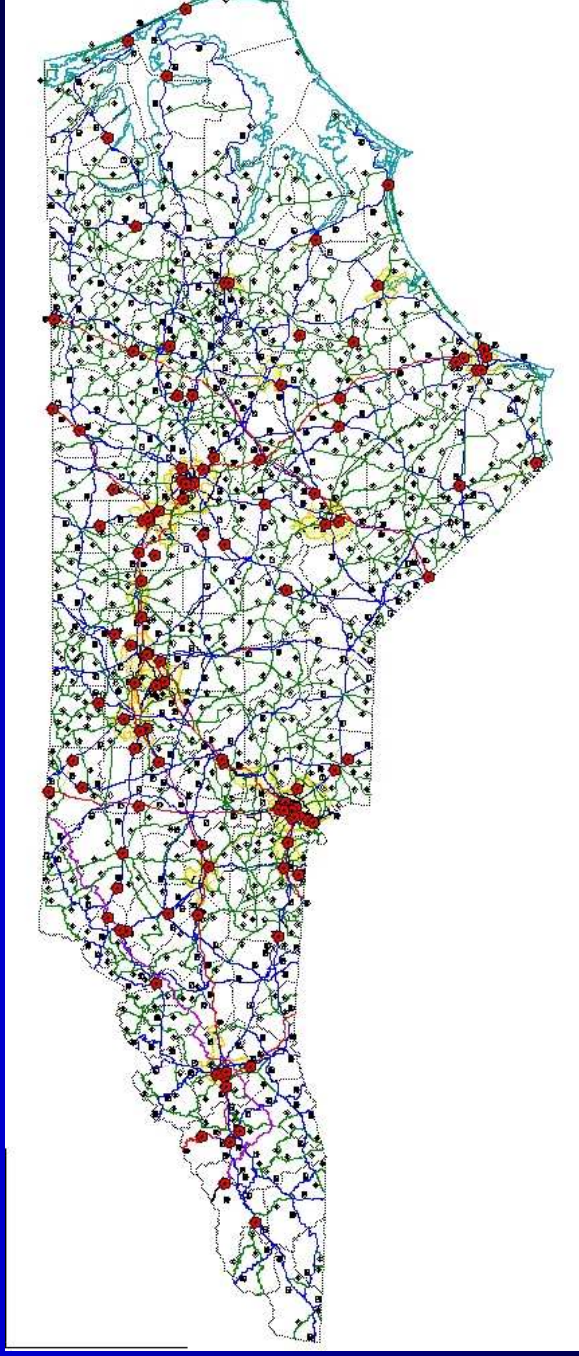
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CONTINUOUS VOLUME MONITORING

- *ATR - Automatic Traffic Recorders at 80 Stations*
- *Interstate, Major Arterial, Minor Arterial, Collector, and Local*
- *Generate seasonal factors for short term counts*
- *Reported to FHWA for Travel Volume Trends (TVT)*



http://www.fhwa.dot.gov/policyinformation/travel_monitoring/tvt.cfm

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CONTINUOUS CLASS & WEIGHT MONITORING

- *WIM - Weigh In Motion Collects both Class and Weight Data*
- *Historically have operated 45 WIM stations*
- *Legacy WIM sites being phased out*
- *WIM System is being changed to support MEPDG*



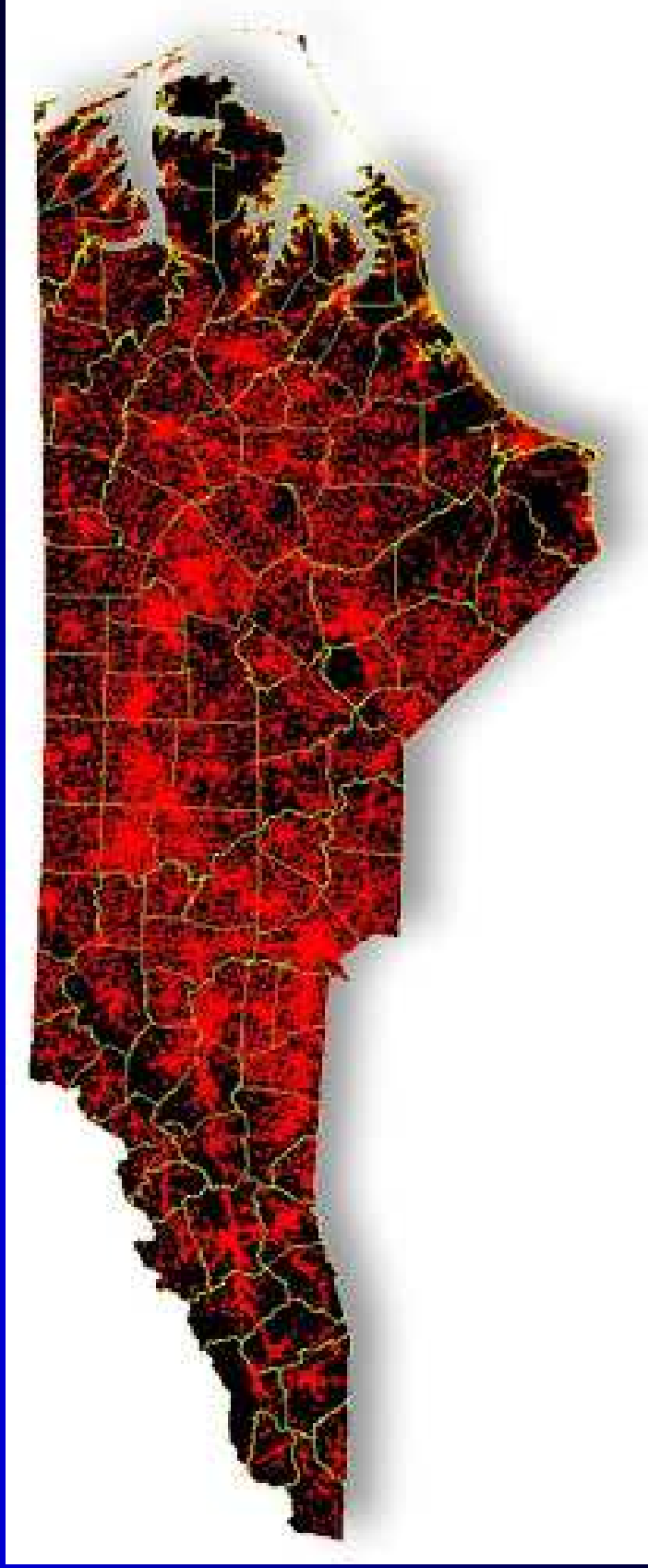
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VOLUME COVERAGE

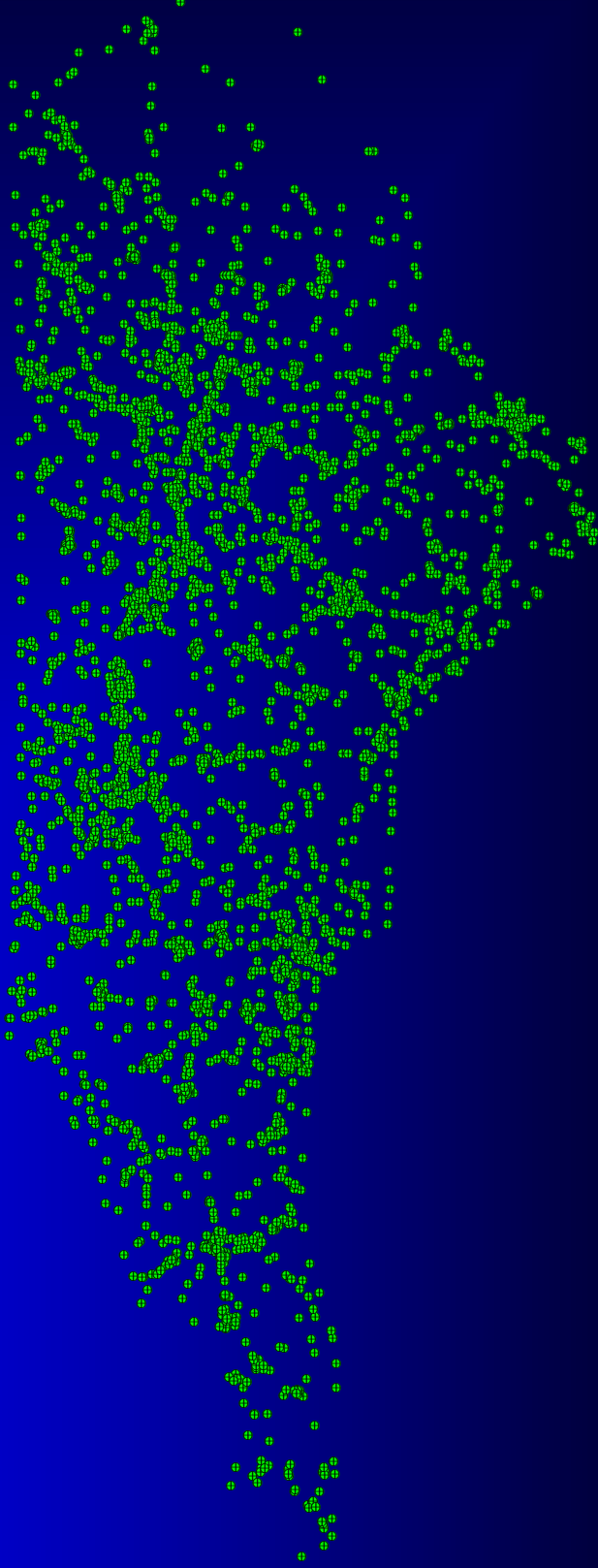
- *PTC - Portable Traffic Counts Collected at 48,000 Stations*
- *Collect Daily Counts over 48 Hours*
- *Interstate Based on Freeway Ramp Balancing Procedures*



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VEHICLE CLASS COVERAGE

- *Historically Collected PVC Data at 600 Stations (Sampling)*
- *Used for Statewide Average Values and HPMS*
- *Collect Hourly Counts for 13 Vehicle Classes over 48 Hours*
- *Building a PVC Coverage of NC Truck Routes at 3,200 stations*



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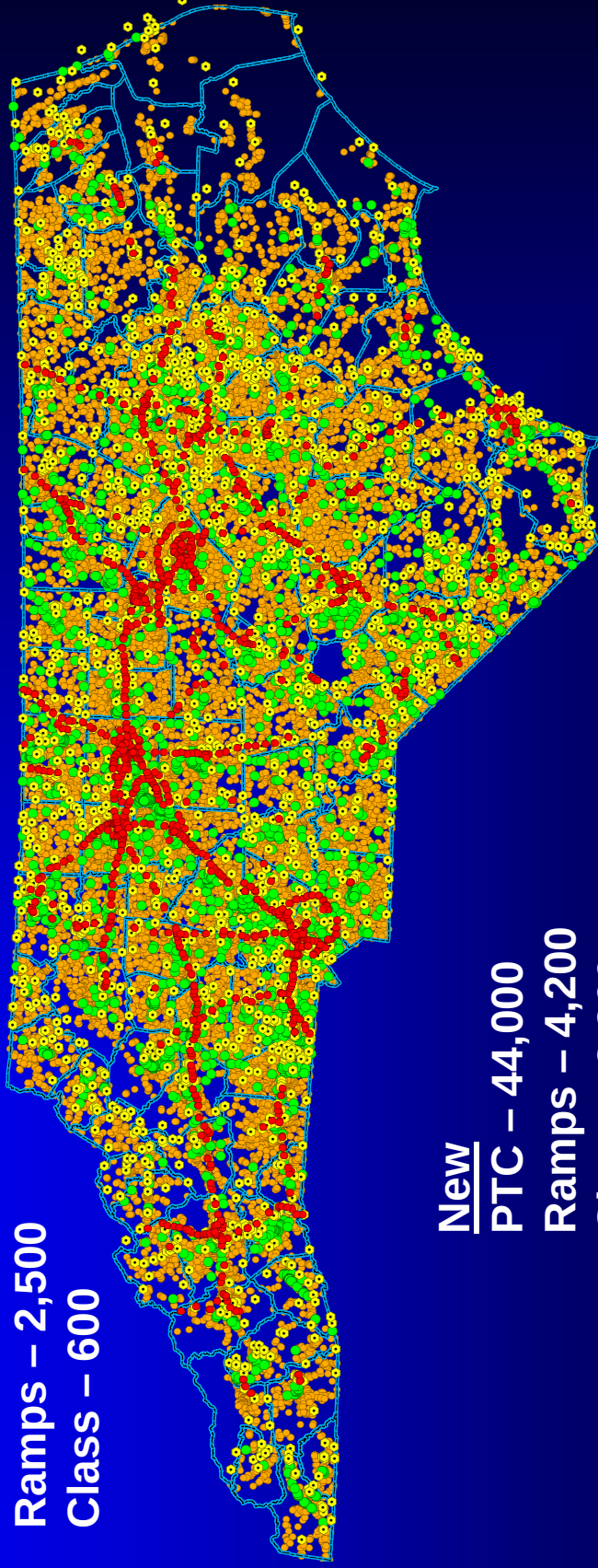
Traffic Monitoring Expansion

Legacy

PTC – 40,000

Ramps – 2,500

Class – 600



New

PTC – 44,000

Ramps – 4,200

Class – 3,200+

Collect about 30,000 counts annually!

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VOLUME COVERAGE SCHEDULING

- *Interstates Counted Annually*
- *Urban Counted Biennially
(9 Odd and 8 Even)*
- *Rural Primary Routes Counted Annually*
- *Rural Secondary Routes Counted Biennially
($\frac{1}{2}$ Odd and $\frac{1}{2}$ Even)*

CLASS COVERAGE SCHEDULING

Still being developed – minimum of every 3 years



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PROJECT COUNT PROGRAM

In 2011 we provided the following services on 93 projects:

Traffic Data Collected: Total 2,078 Counts

Electronic Counts

Daily – 376

Hourly – 625

Vehicle Class – 711

Manual Counts

Turning Movement – 220

Manual Class – 146

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Traffic Data Resources

Continuous Count Program: Extensive data sets at a few locations

ATR – Hourly Volume

AVC – Hourly Class

WIM – Hourly Class and Truck Weight

Data, factors, and statistics

Traffic Data Resources

Coverage Count Program: Small amount of data at many locations

PTC – Current AADT, historic AADT
PVC – Hourly class by lane, annualized volumes, percentages and distributions, limited history

Traffic Data Resources

Project Count Program: Collect data as required by the customer

Daily – Daily Volume

Hourly – Hourly Volume

Class – Hourly Weekday Class, %Dist.

TM – Turning Movements, Daily Volume, Peak Hour Data, Truck Data on one leg

MC – Peak Hour Data, Truck Data

Traffic Characteristics

Annual Average Daily Traffic (AADT)

A daily traffic volume for all lanes in both directions passing a point in the highway system. It represents the average of all days during the year with typical traffic conditions.

The most basic traffic statistic generated by seasonally factoring short term counts.

Factoring Volume Data

Generally factor volume data to a common analysis horizon:

$$RC \times AF \times SF = V_{AH}$$

WHERE -

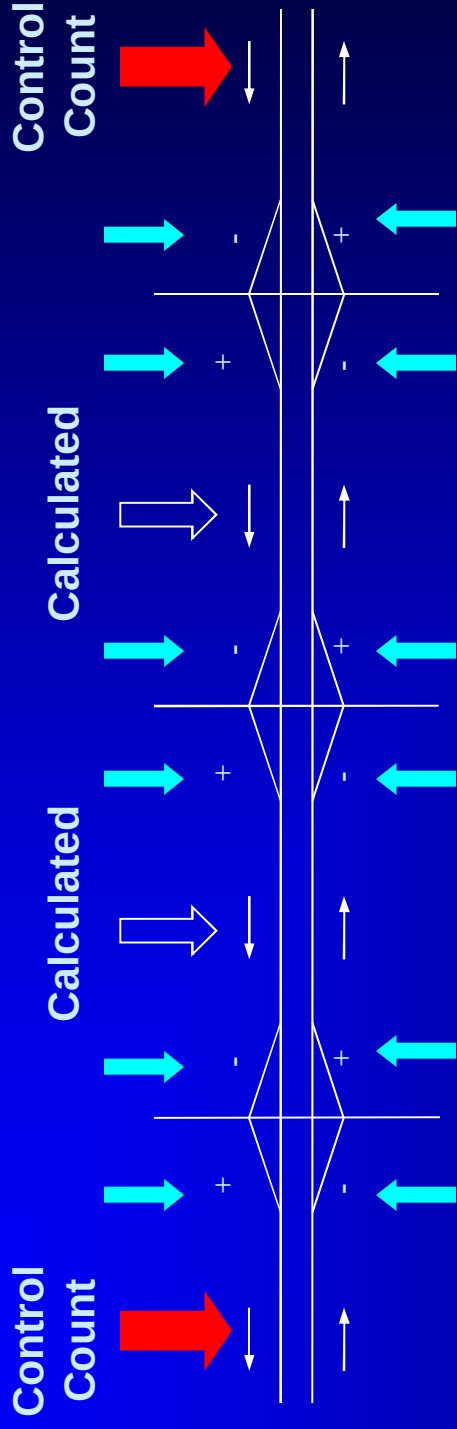
RC = Raw Count

AF = Axle Factor to convert from axle pairs to vehicles

**SF = Seasonal Factor that adjusts volume from
horizon collected to horizon being analyzed**

V_{AH} = Volume to be analyzed

Freeway Ramp Balancing Procedure



- Ramp balancing is performed by direction
- Collect counts on the mainline to balance between (Control Counts)
- Collect all OFF and ON flows between controls (Ramp Counts)
- Base AADT are generated at controls
- Unbalanced AADT are calculated using OFF and ON flow ADT
- Adjustment factors are generated from Unbalanced AADT and Base AADT
- Adjustment factors are applied to OFF and ON flow ADT to balance calculations
- Balanced AADT for uncounted segments are calculated

Factoring Class Data

Generally factor class data by type to a common analysis horizon:

$$RC_{SU} \times SF_{SU} = V_{SU}$$

$$RC_{MU} \times SF_{MU} = V_{MU}$$

WHERE -

RC = Raw Count

SF = Seasonal Factor that adjusts class volume from horizon collected to horizon being analyzed

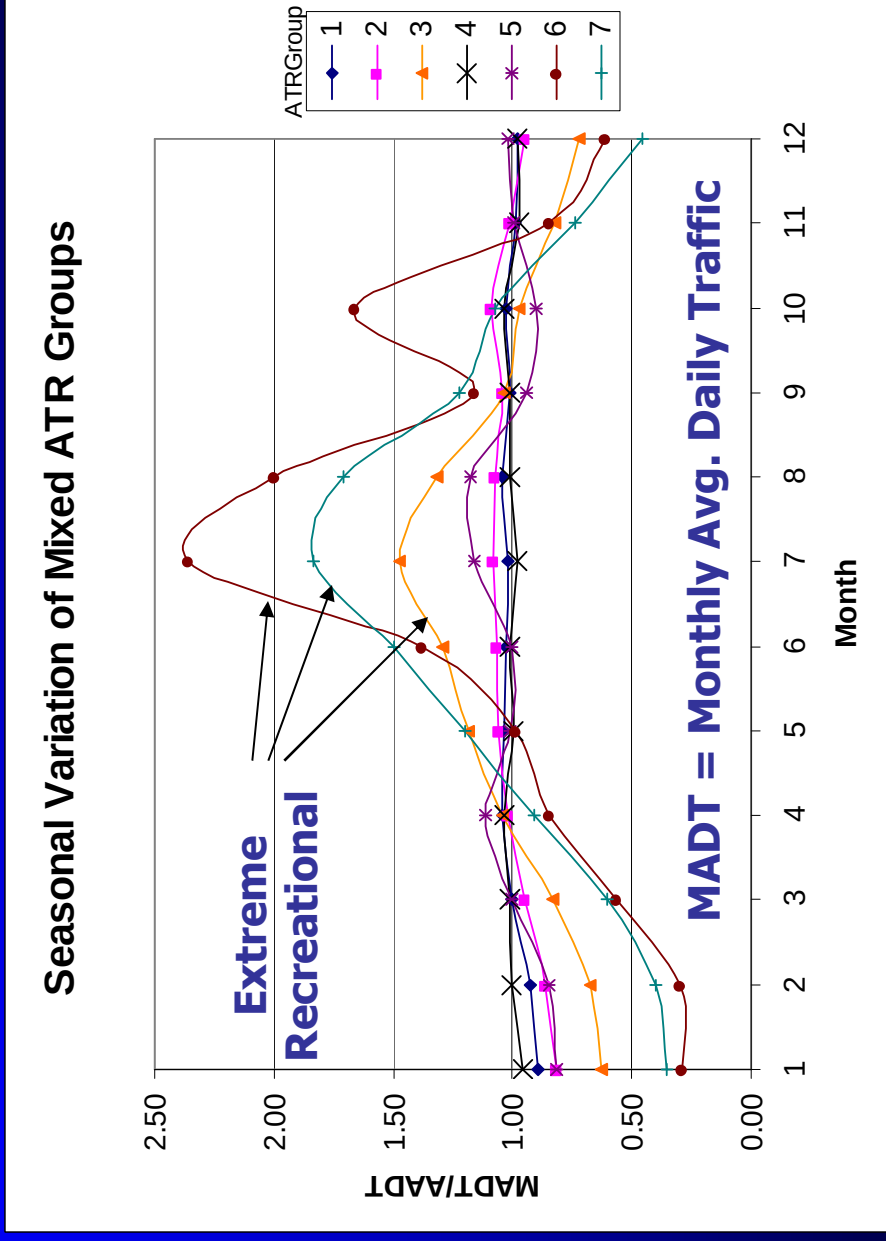
V_{AH} = Volume to be analyzed

SU = Single Unit Truck

MU = Multi Unit Truck

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CONTINUOUS VOLUME MONITORING

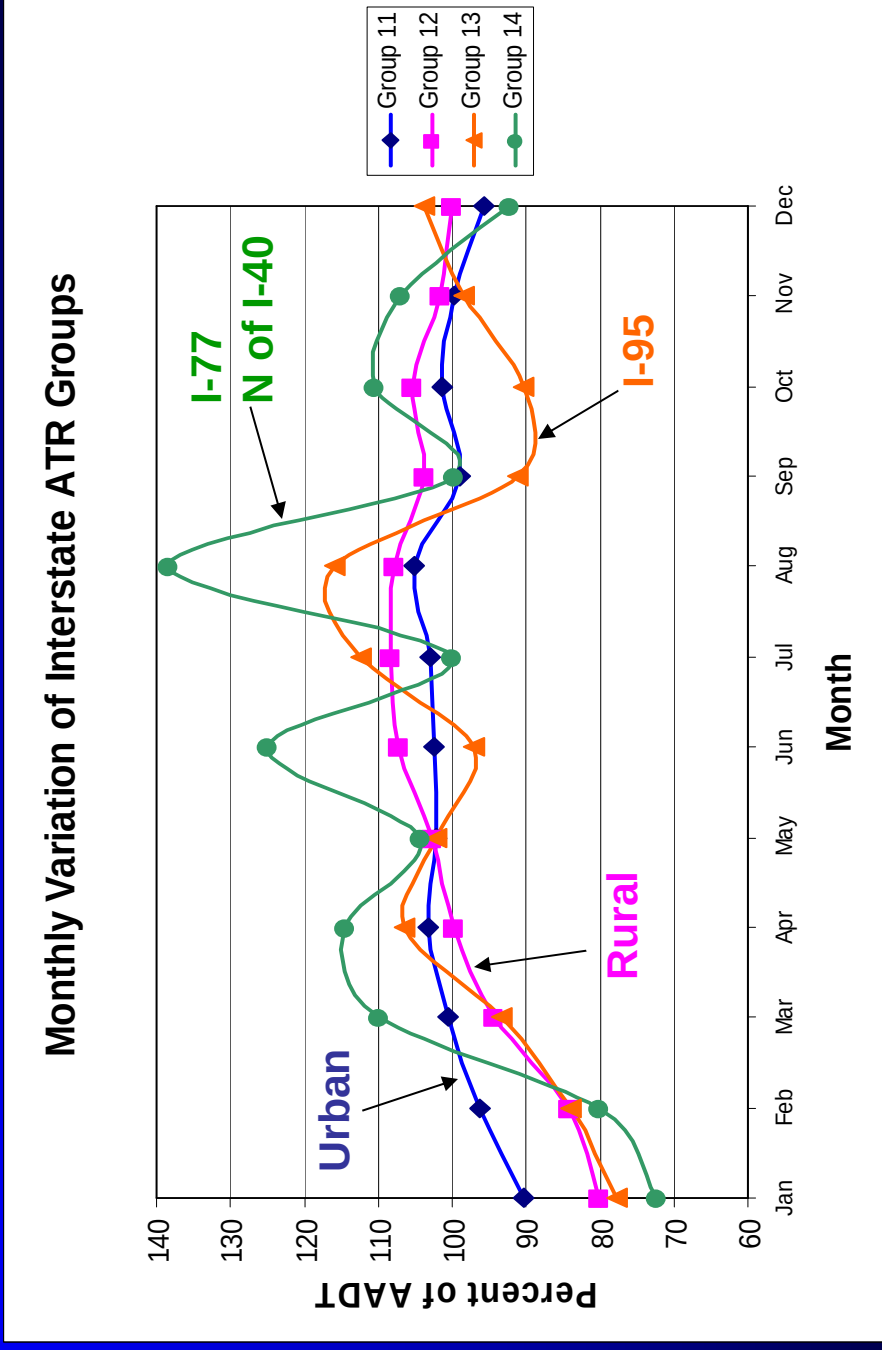


High variability recreational used on very limited basis

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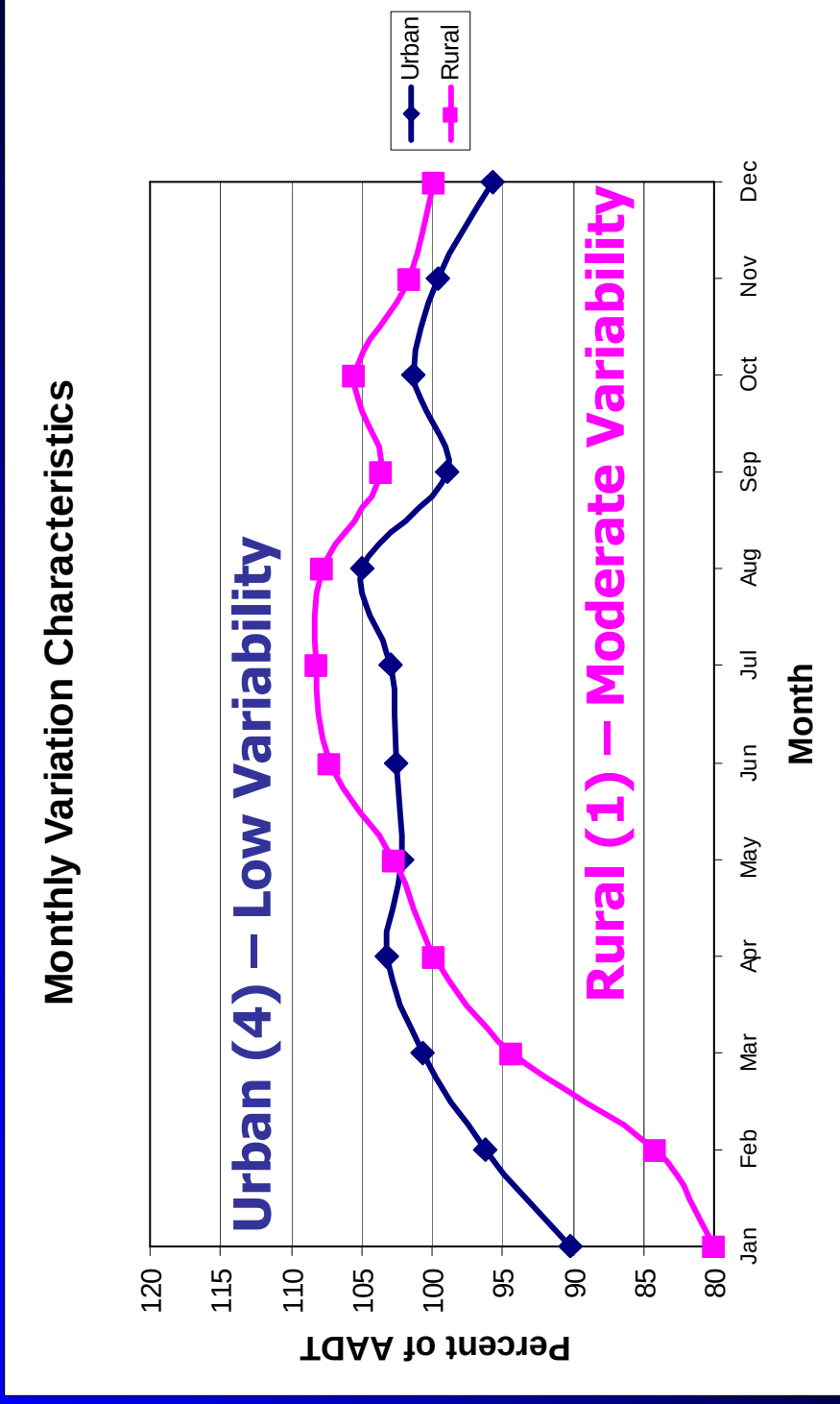
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CONTINUOUS VOLUME MONITORING



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CONTINUOUS VOLUME MONITORING



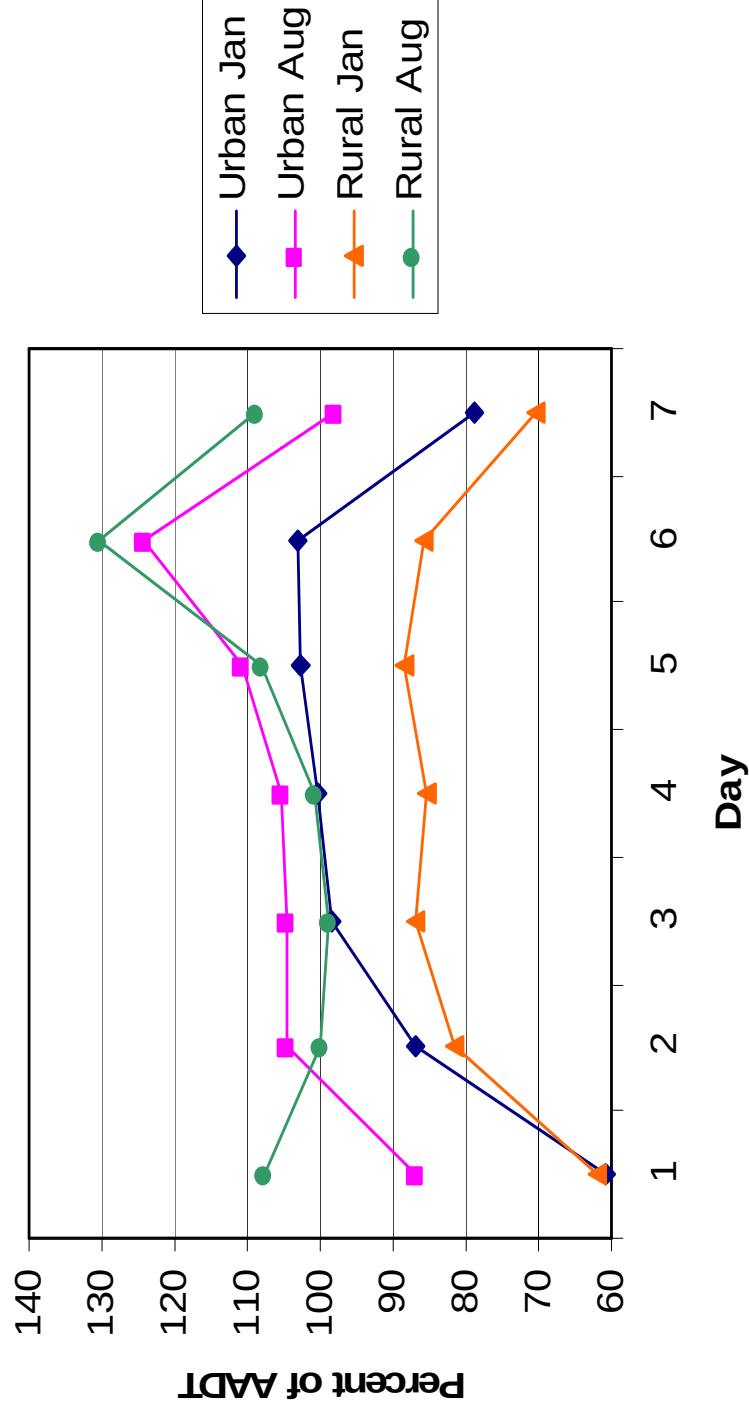
These two groups assigned to 95% of stations

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CONTINUOUS VOLUME MONITORING

Day of Week Characteristics

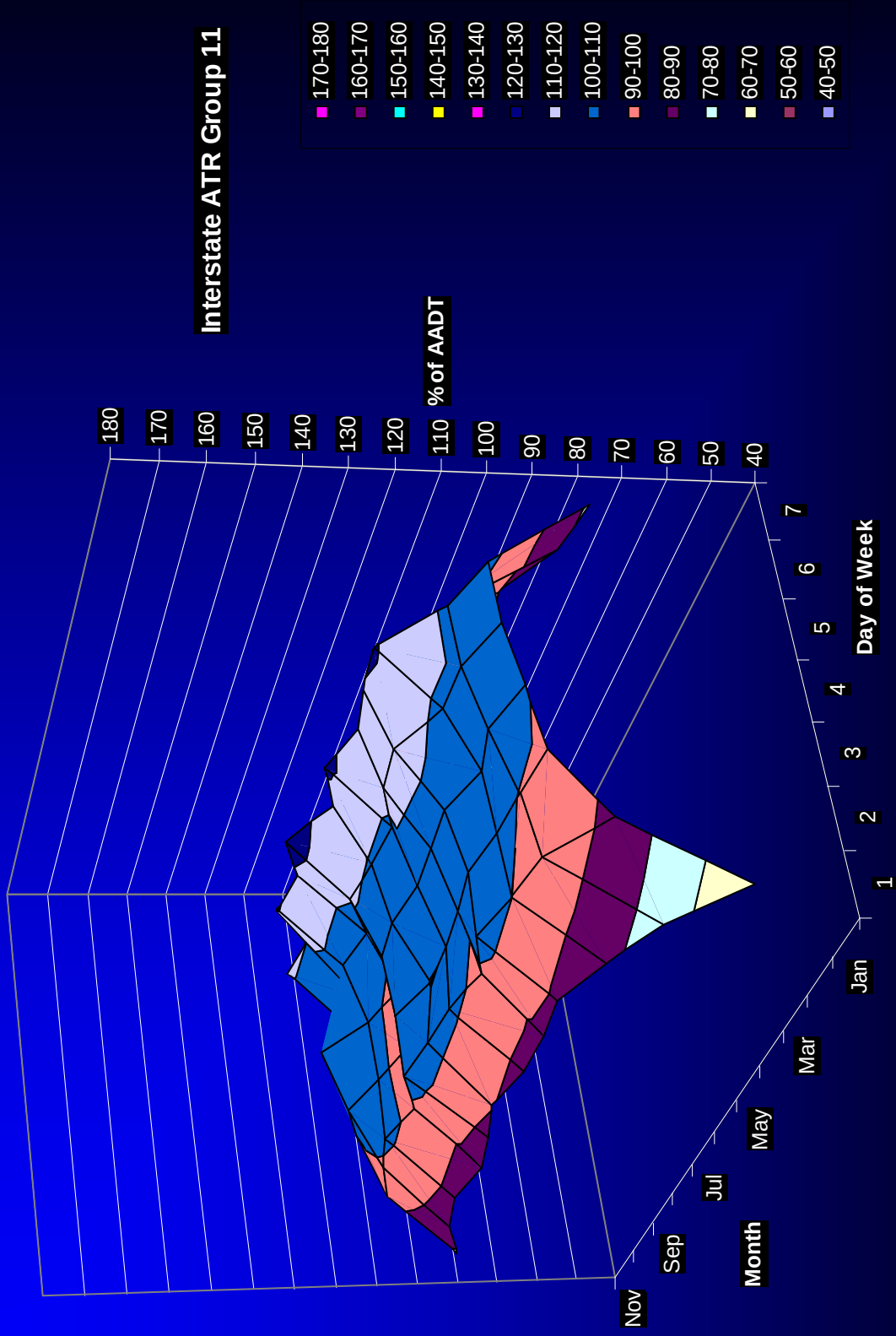


These are typical weekday patterns



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CONTINUOUS VOLUME MONITORING



This is a complete seasonal pattern

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Design Hour Statistics

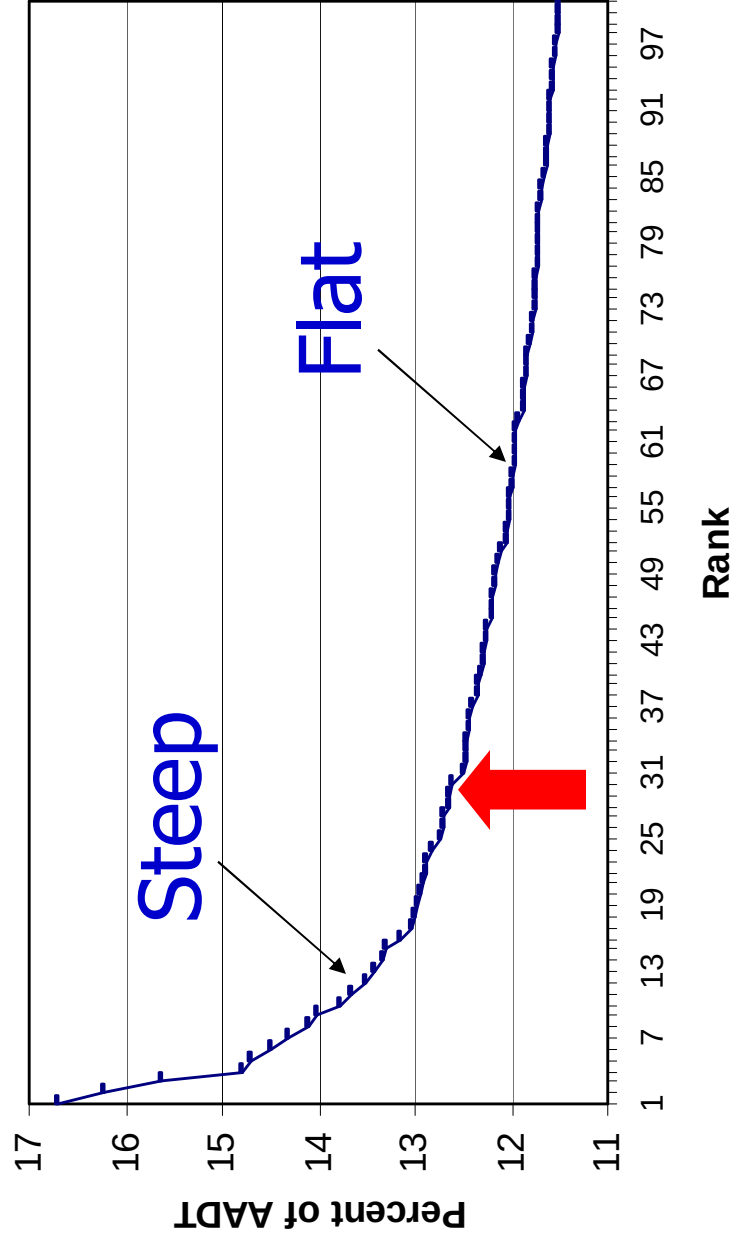
K-Factor: Percent of AADT occurring during a specific hour (two way volume)

- 30th highest hour is a typical design value
- standard values are used instead of measured values due to base year congestion
- a lower ranked hour (e.g. 100th) is often used on recreational facilities

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K Factors

A9402 Ranking of Percent AADT



The typical K Factor (30th) is suitable

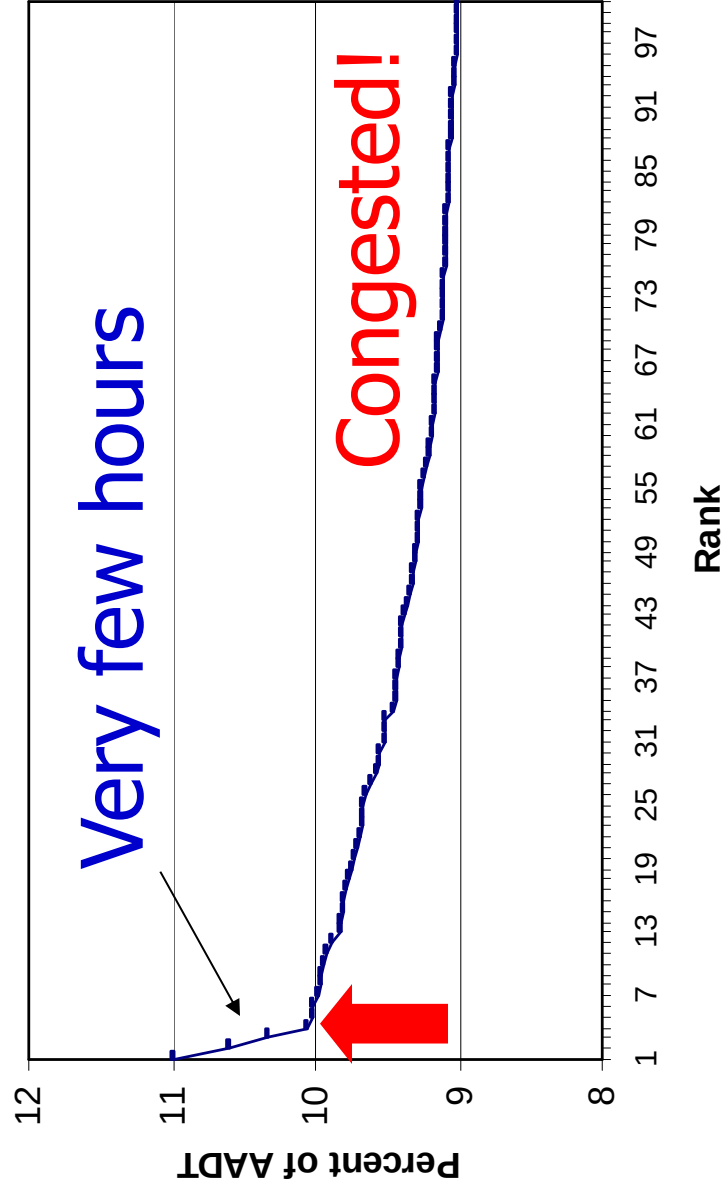
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K Factors

A4001 Ranking of Percent AADT

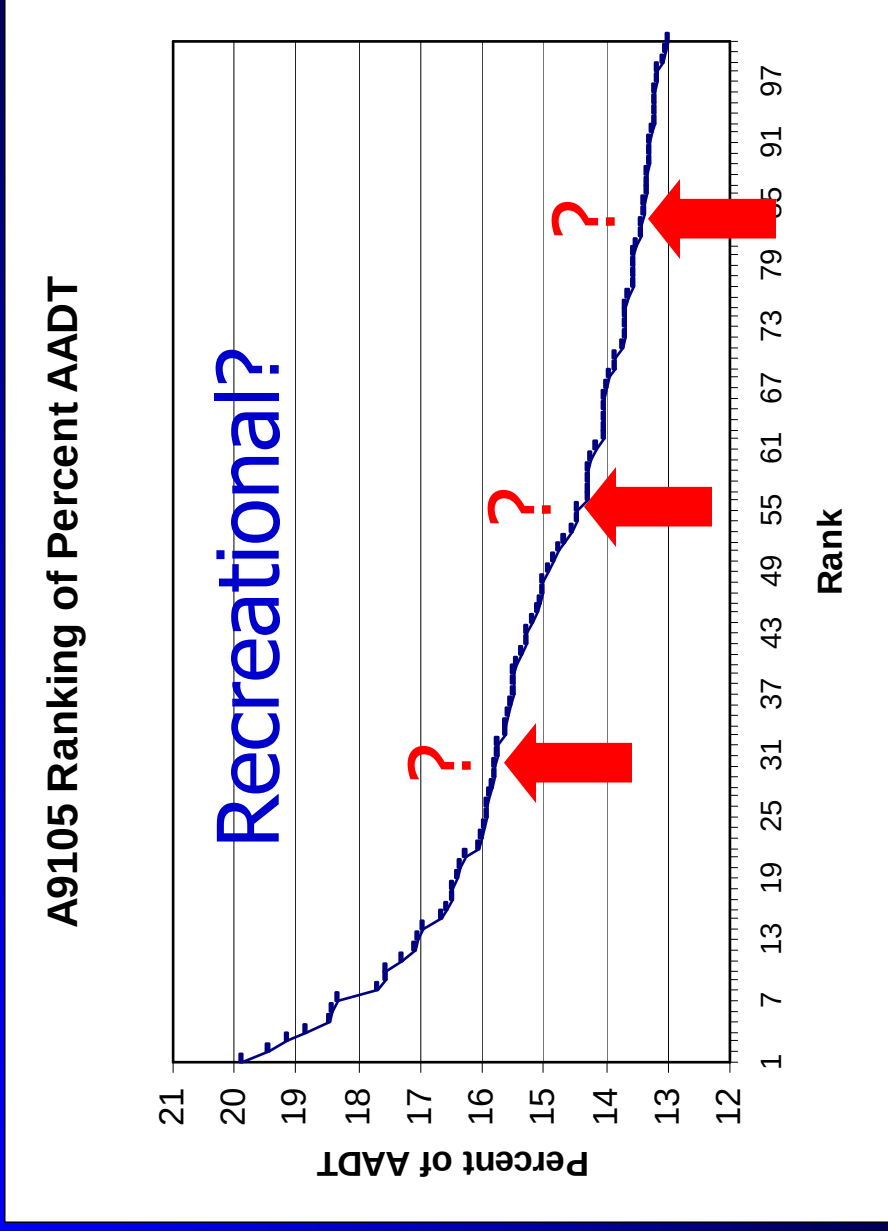


A standard K Factor is appropriate

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K Factors



Design Hour Statistics

D-Factor: Percent of two way design hour volume occurring in the design (peak) direction

- often calculated using base year data
- should be adjusted up if peak direction experiences congestion and off peak doesn't
- standard values are sometimes used
- radials often have higher D values
- circumferentials often have lower D values

Design Hour Statistics

Truck Percentages

Duals: Percent of Single Unit Trucks

TTST: Percent of Multi Unit Trucks

- current practice uses weekday counts
- truck volumes not annualized
- truck percent static over design period

In general, we overestimate trucks for design



FHWA 13 CLASS SCHEME

NCDOT 4 CLASS SCHEME

PD

Class 2 – Passenger Cars

Class 3 – 2 Axle 4 Tire Vehicles

Class 4 – Buses

Class 5 – 2 Axle SU

Class 6 – 3 Axle SU

Class 7 - 4 or More Axle S/U

Class 8 - 4 Axle TTST with a Single Trailer

Class 9 – 5 4/16 TTCT with a Single Trailer

Class 3 - 3 AVE 17.51 with a single trailer
Class 10 - 6 AVE T1CT with 3 Sinal Trailor

Class 10 — 6 Ave 11/31 with a single 11/40

Class 12 – 3 Axle / 151' Multi / 20 Trailers

Class 12 - 0 AXLE / 131' W/ 11 TWO TRAILERS

CLASS 13 = / AXLE / 13 / WITH TWO TRAILERS

PV - Passenger Vehicles

S11 - Single Unit Trucks

50 Single Unit Trucks

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Forecasts

DUALS

TST

M E P D G

PV CLASS



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DUALS CLASS



TTST CLASS



TWIN CLASS



Traffic Data Referencing Concepts

Collection Elements – All traffic counts are collected at points on the highways

Station ID

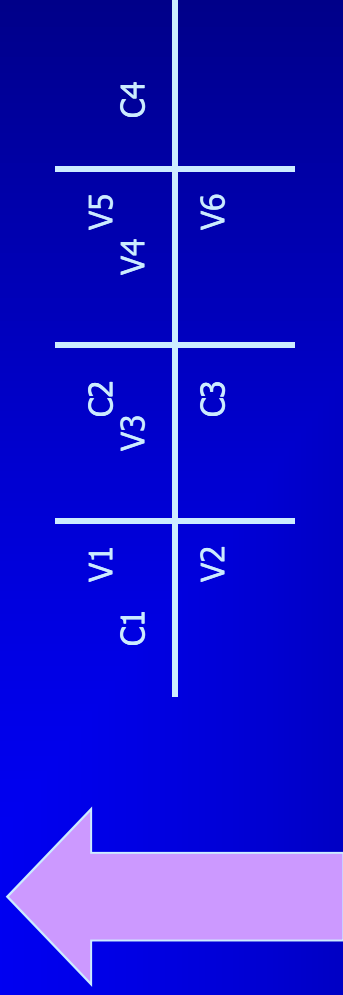


Reporting Elements – Traffic data are used on segments for HPMS and other purposes



Traffic Data Referencing Concepts

Collection Elements



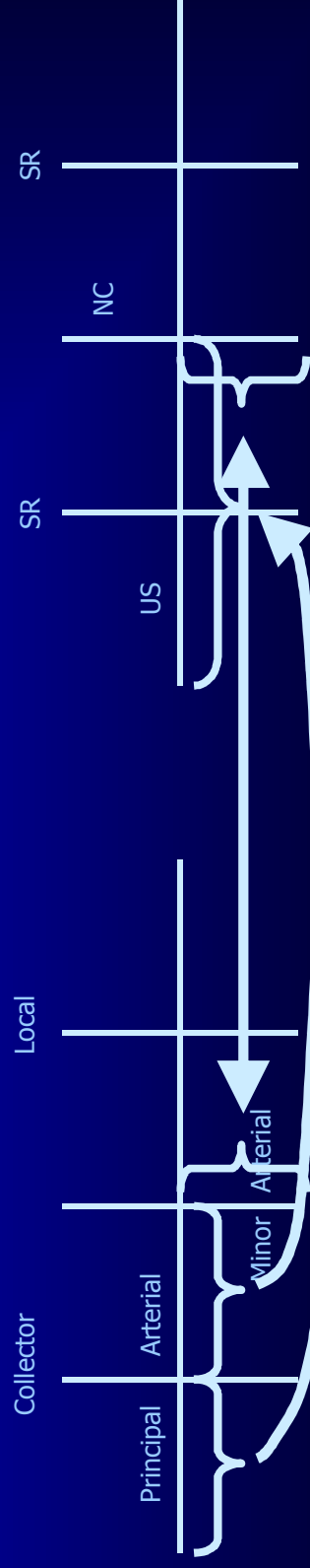
Reporting Elements

AADT

HPMS >> All FC Down to Major Collectors
NCDOT >> Traffic Flow

Trucks

HPMS >> NHS
NCDOT >> Truck Routes



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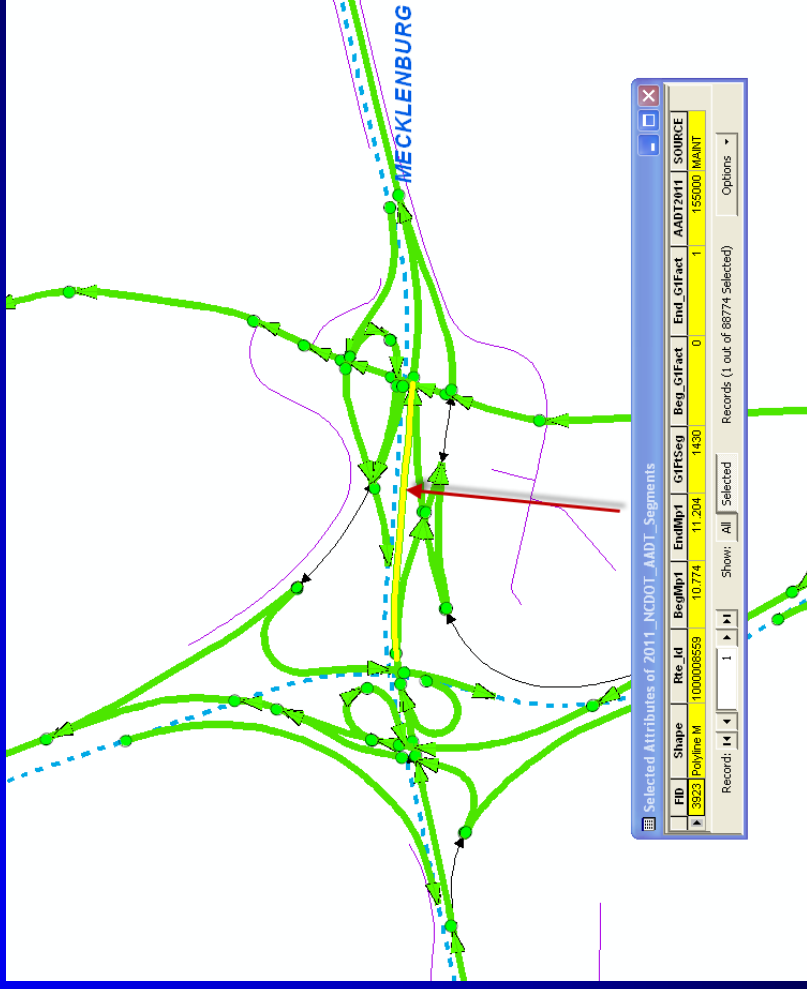
Business Rule – Class segments never bisect an AADT segment

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Traffic Referencing Products

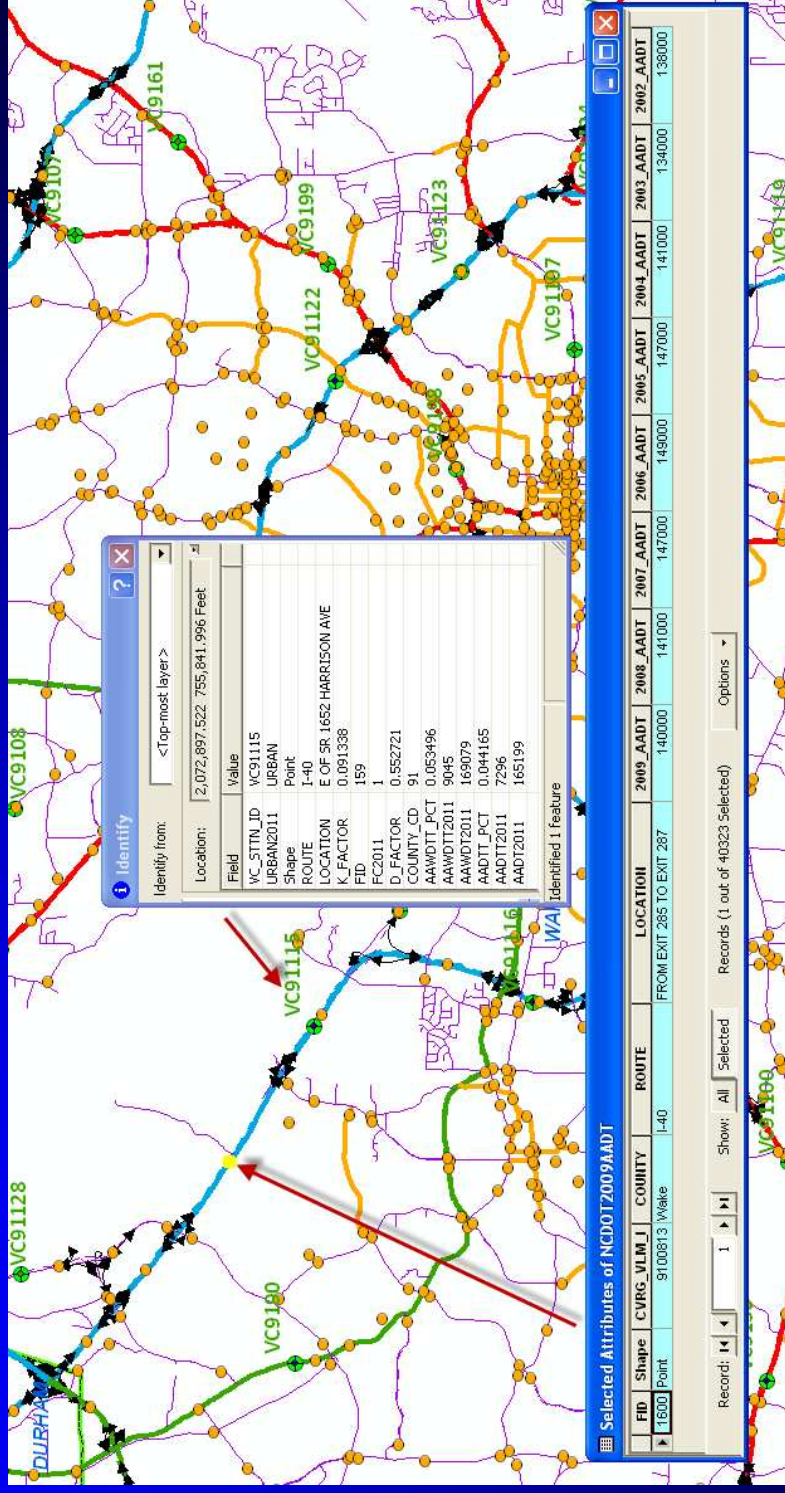
- Spatial – Arcs are updated to match published GIS arcs for spatial references
- LRS – The G1ftseg and begin and end factors are updated to provide tabular references (event data)
- Route/Milepost – references are attributed with current values for tabular references (event data)

Traffic Referencing Products



NCDOT 2011 AADT Shapefile

Traffic Referencing Products



NCDOT 2011 AADT Shapefile



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http://www.ncdot.gov/doh/preconstruct/tpb/traffic_survey/

****2011 AADT UPDATE****

The following NCDOT - Traffic Survey Products have been updated or added to the Product Links box

- The AADT Stations ArcGIS point shapefile layer (2011 UPDATE)
- The AADT Stations Description Document (NEW 2011 RESOURCE)
- The AADT Segments ArcGIS line shapefile layer (NEW 2011 PRODUCT)
- The AADT Segments Description Document (NEW 2011 RESOURCE)
- The 2011 Interstate & Freeway Report (2011 UPDATE)

****Coming Soon:The 2011 AADT Excel and PDF Report****

Annual Average Daily Traffic (AADT) Traffic Volume Map

An AADT is an Annual Average Daily Traffic volume for all lanes in both directions passing a point on the highway system. It represents the average of all days during the year with typical traffic conditions. An AADT estimate is generated using procedures that comply with the standards specified in the Traffic Monitoring Guide published by the Federal Highway Administration.

With more than 40,000 Portable Traffic Count (PTC) Stations located throughout North Carolina, Traffic Survey has adopted the following data collection schedule:

- Interstate route volumes are collected on an annual basis with the exception of stations which fall within the off cycle urban areas. (See urban area cycle below) *Reference county maps for the most current Interstate data within off cycle urban area. (Off cycle means the year in which data will not be collected.) *Reference urban maps for the most current Interstate data within on cycle urban area. (On cycle means the year in which data will be collected.)
- US and NC route volumes are also collected on an annual basis with the exception of stations which fall within the off cycle urban areas. (see urban area cycle below)
- Secondary Road (SR) volumes are collected on a biennial cycle with approximately half being counted each year. If a particular secondary road is not available for the most current year, it may be available for the prior year.
- North Carolina's eighteen largest urban areas are counted on a biennial cycle with 10 urban areas counted during the

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PRODUCT LINKS:

- AADT Traffic Volume Maps
 - AADT MAPS
 - AADT Stations Shapefile
 - AADT Stations Document
 - AADT Segments Shapefile
 - AADT Segments Document
- AADT Traffic Volume Reports
 - 2010 AADT Excel Spreadsheet
 - 2010 AADT PDF Report
- AADT Interstate & Freeway Volume Reports
 - 2007 Interstate & Freeway Report
 - 2008 Interstate & Freeway Report
 - 2009 Interstate & Freeway Report
 - 2010 Interstate & Freeway Report
 - 2011 Interstate & Freeway Report

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<http://www.ncdot.gov/travel/statemapping/trafficvolumemaps/default.html>

If you are interested in learning more about Traffic Survey's mission, traffic data collection process and traffic data products, please visit their [website](#).

If you have further questions concerning Traffic Count Data Information, please contact the NCDOT Traffic Survey Group.

By clicking on the Traffic Volume Map links below, you can access the individual county sheets in PDF format. The name of the county will be followed by a number. These numbers represent each sheet, i.e., Sheet 2 of 9. If you do not know which sheet you need, click on the "sheet key". If a sheet key is not available, you can ALWAYS find a sheet key on the 1st sheet for each county.

Urban Area AADT Traffic Maps

To view available Urban AADT Maps, please click one of these links:

- | | | | |
|--|--------------------------------|--------------------------------|---------------------------------|
| ■ Asheville | ■ Durham | ■ Greenville | ■ Rocky Mount |
| ■ Burlington | ■ Fayetteville | ■ Hickory | ■ Wilmington |
| ■ Chapel Hill | ■ Gastonia | ■ High Point | ■ Winston Salem |
| ■ Charlotte | ■ Goldsboro | ■ Jacksonville | |
| ■ Concord & Kannapolis | ■ Greensboro | ■ Raleigh | |

[View All Available Urban Traffic Maps](#)

County Area AADT Maps by Year

To view available County AADT Maps, please click on of these links:

- | | | | | | | | | | | | | |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| 1999 | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 |
|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|

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<http://www.fhwa.dot.gov/policyinformation/index.cfm>



U.S. Department of Transportation
Federal Highway Administration





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Heavy Vehicle Use Tax					
Highway Finance Data					
Highway Performance Monitoring System					
Motor Fuel and Highway Trust Fund					
National Highway Construction Cost Index					
National Household Travel Survey					
Travel Monitoring					



State Statistical Abstracts

The abstracts contain state-specific data on population, land area, mileage, fuel use, drivers, vehicles, travel, and other related data.

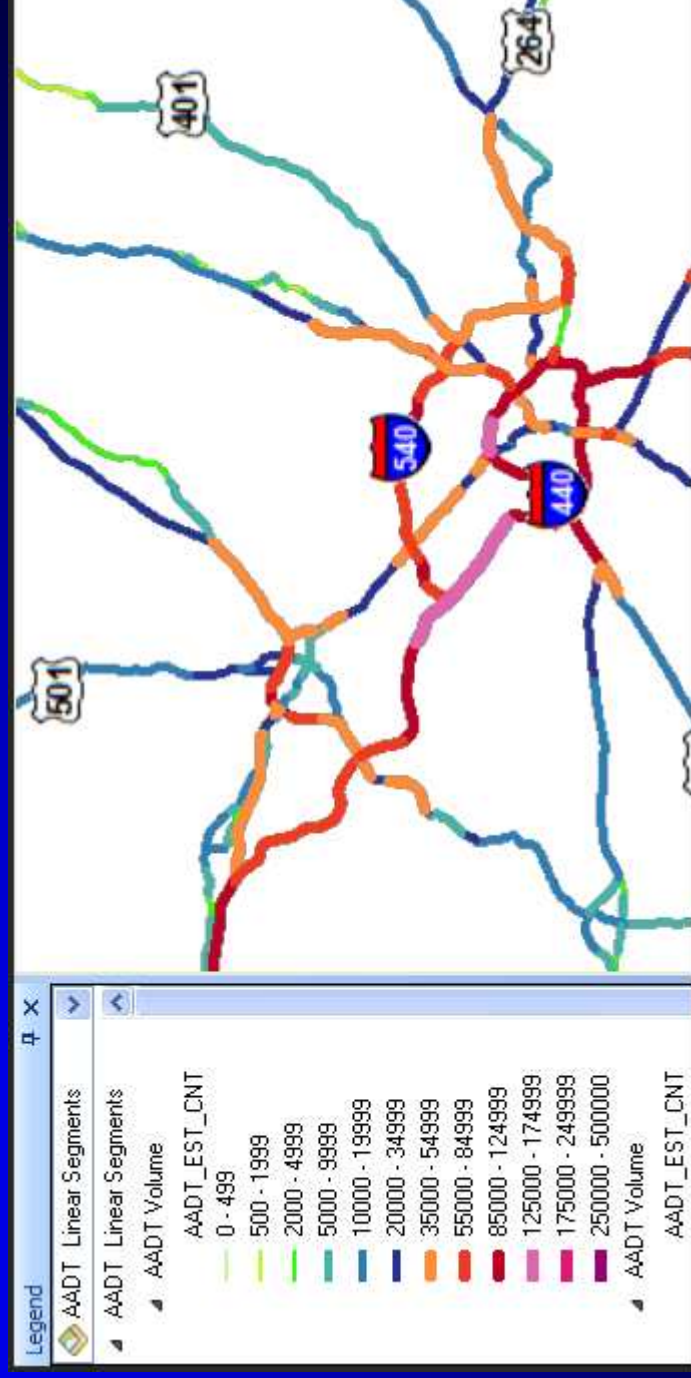


- [2010 State Statistical Abstracts](#)
- [2009 State Statistical Abstracts](#)
- [2008 State Statistical Abstracts](#)

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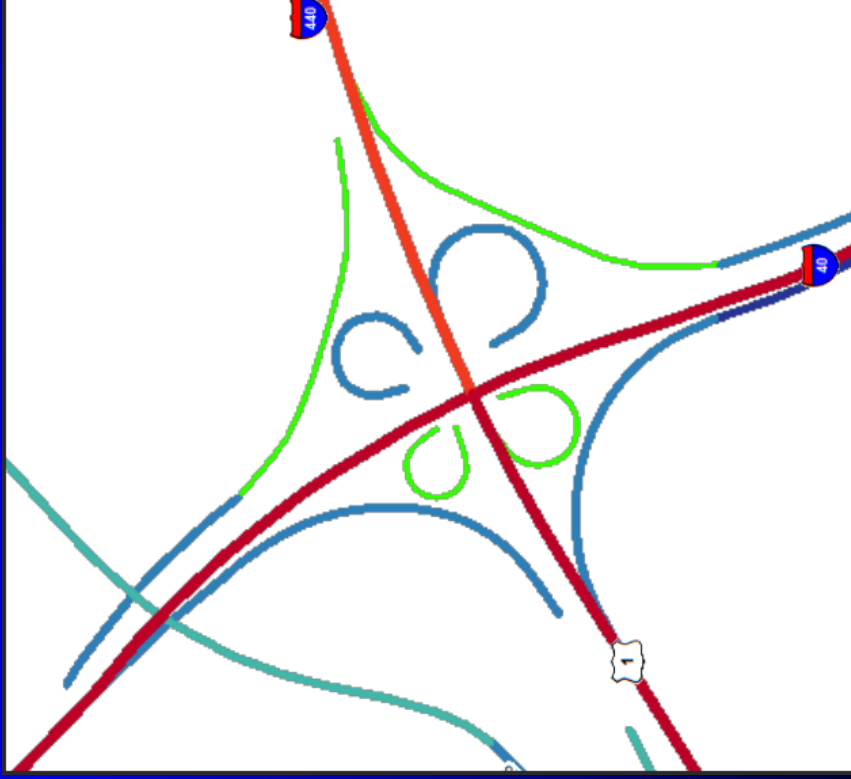
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Spatial Data Viewer



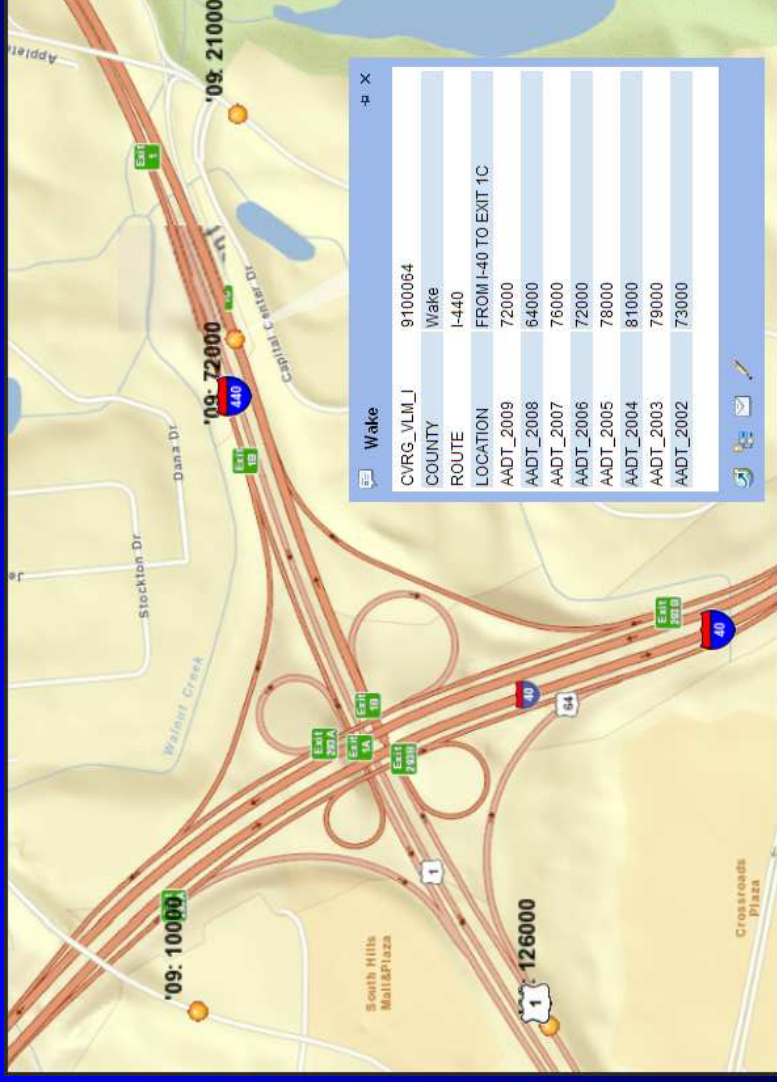
Traffic Flow Map

Spatial Data Viewer



Traffic flow map
is fragmented upon
detailed zoom

Spatial Data Viewer



Monitoring Stations with History

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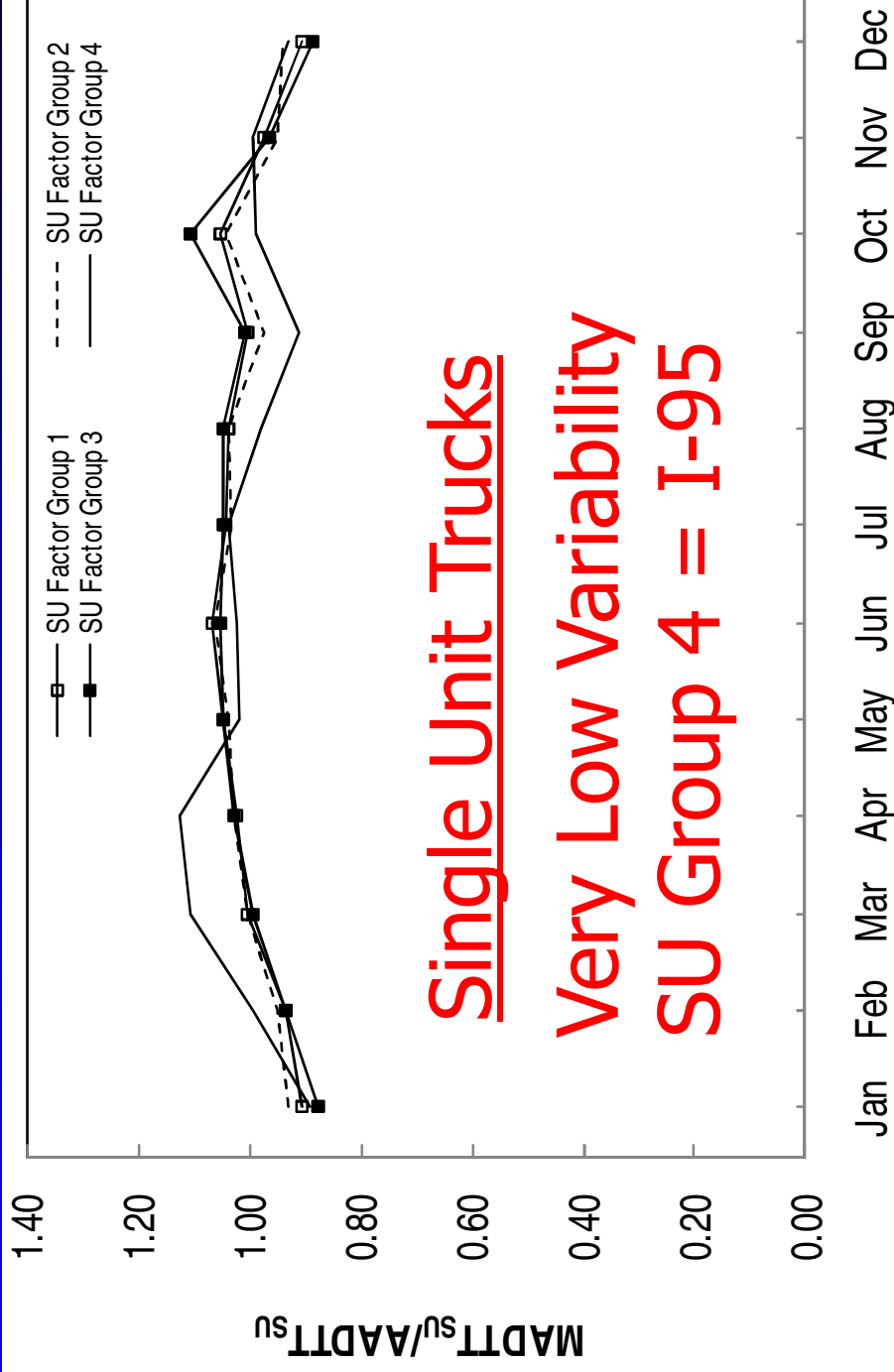
Truck Traffic Characteristics

Annual Average Daily Truck Traffic (AADTT)

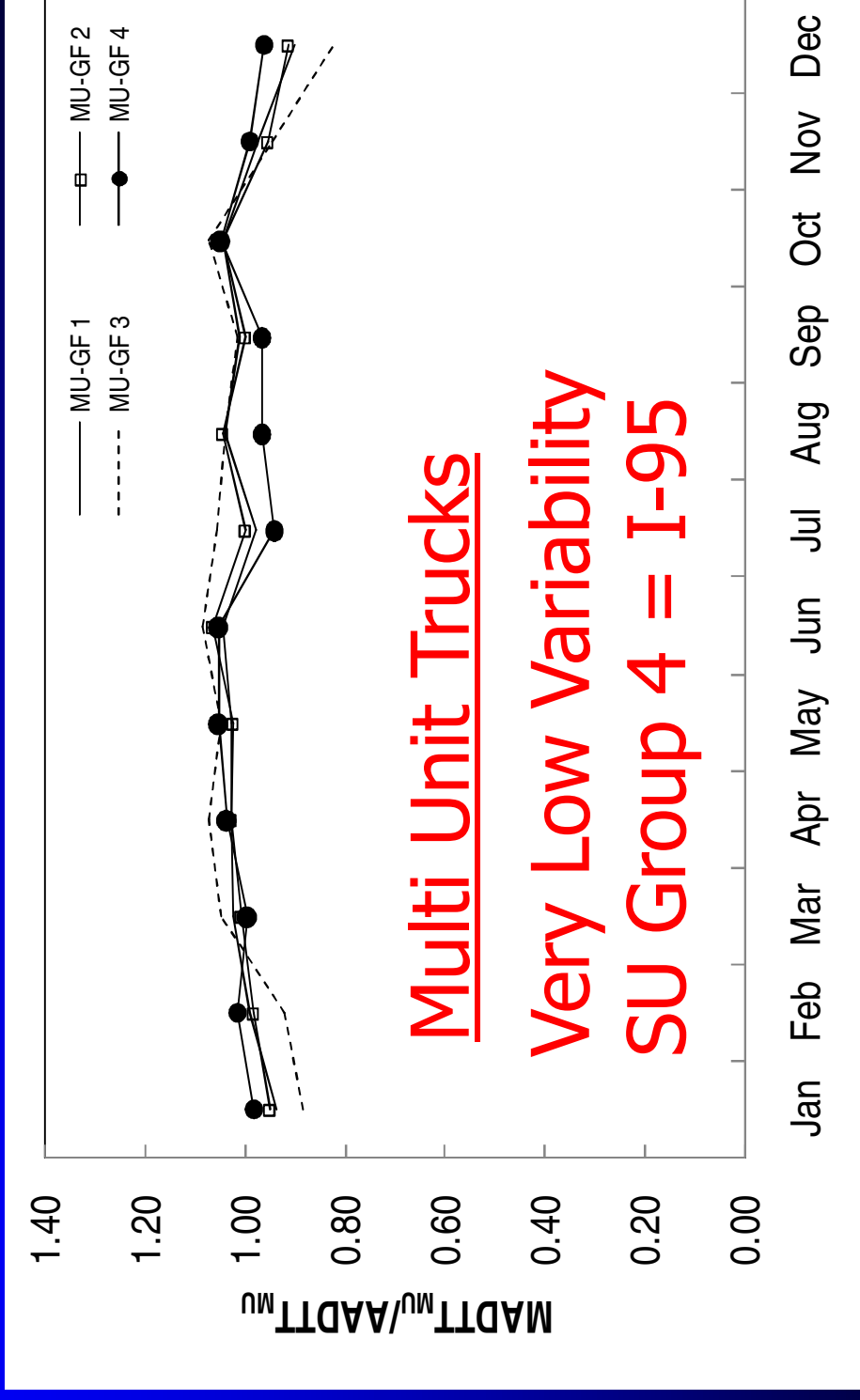
A daily truck volume for all lanes in both directions passing a point in the highway system. It represents the average of all days during the year with typical traffic conditions.

The most basic MEPDG traffic statistic generated by seasonally factoring short term counts.

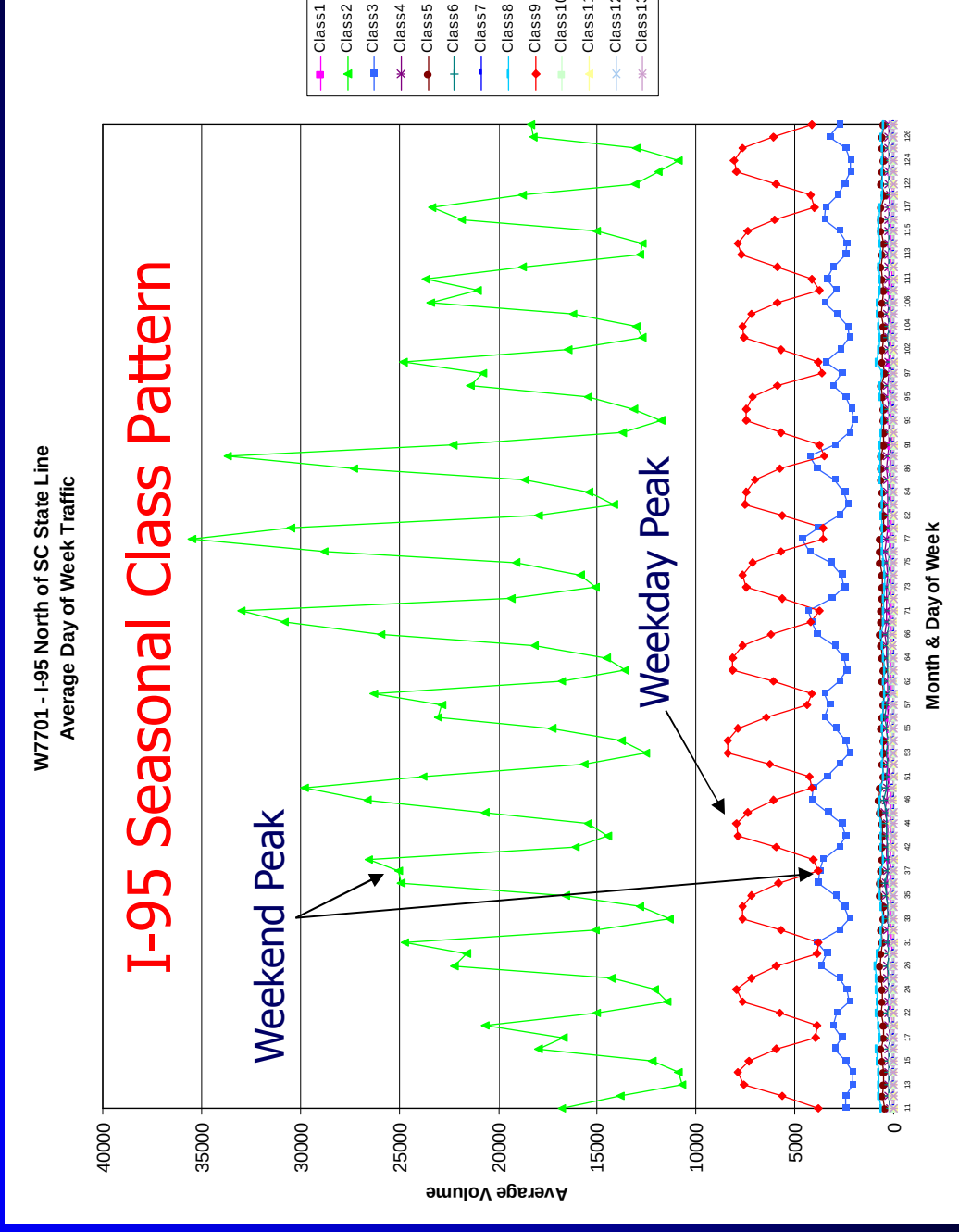
CONTINUOUS CLASS MONITORING



CONTINUOUS CLASS MONITORING



CONTINUOUS CLASS MONITORING



MEPDG Traffic Characteristics

Vehicle Class Distribution (VCD)

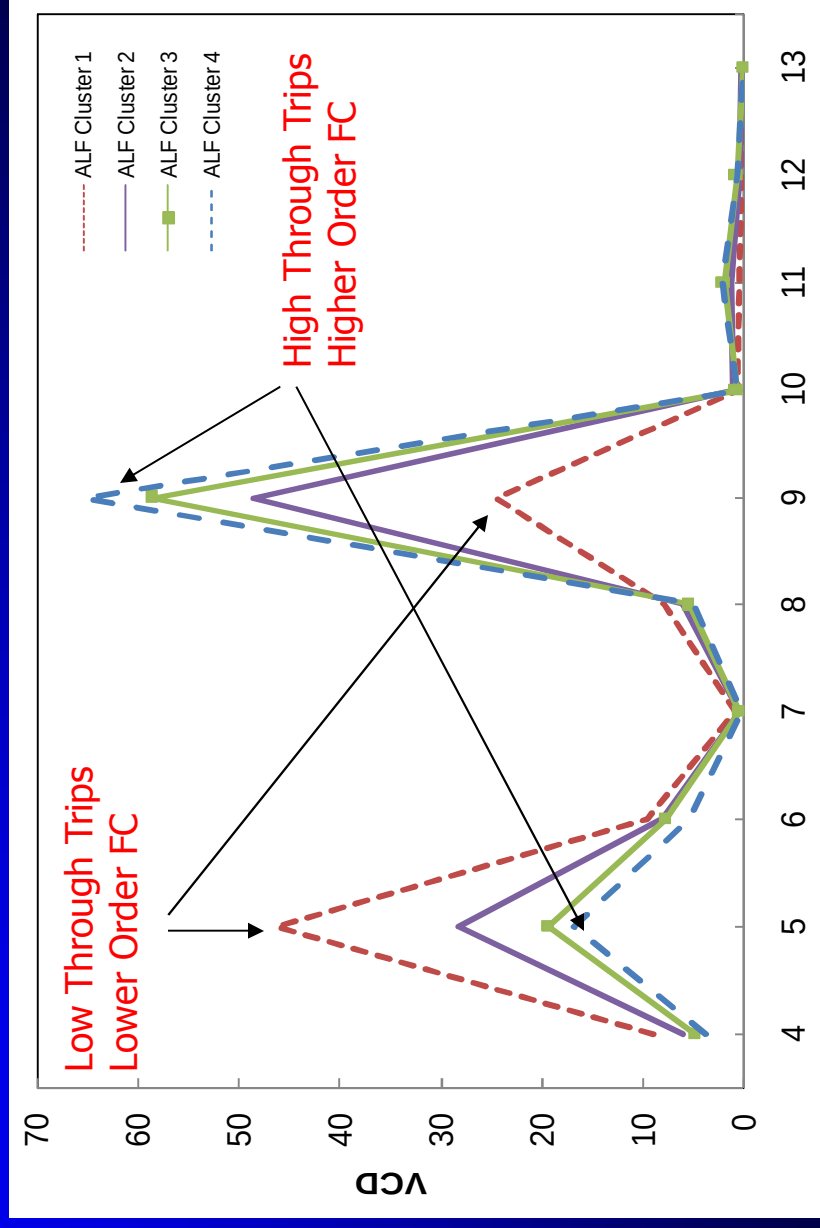
Distribution of total trucks (AADTT) in the 10 FHWA truck classes (Class 4 – 13); annualized truck volumes by class divided by AADTT

Truck Growth

Growth rates and function

CONTINUOUS CLASS MONITORING

Vehicle Class Distributions (VCD)



% of
Total
Trucks

Truck Classes Only!

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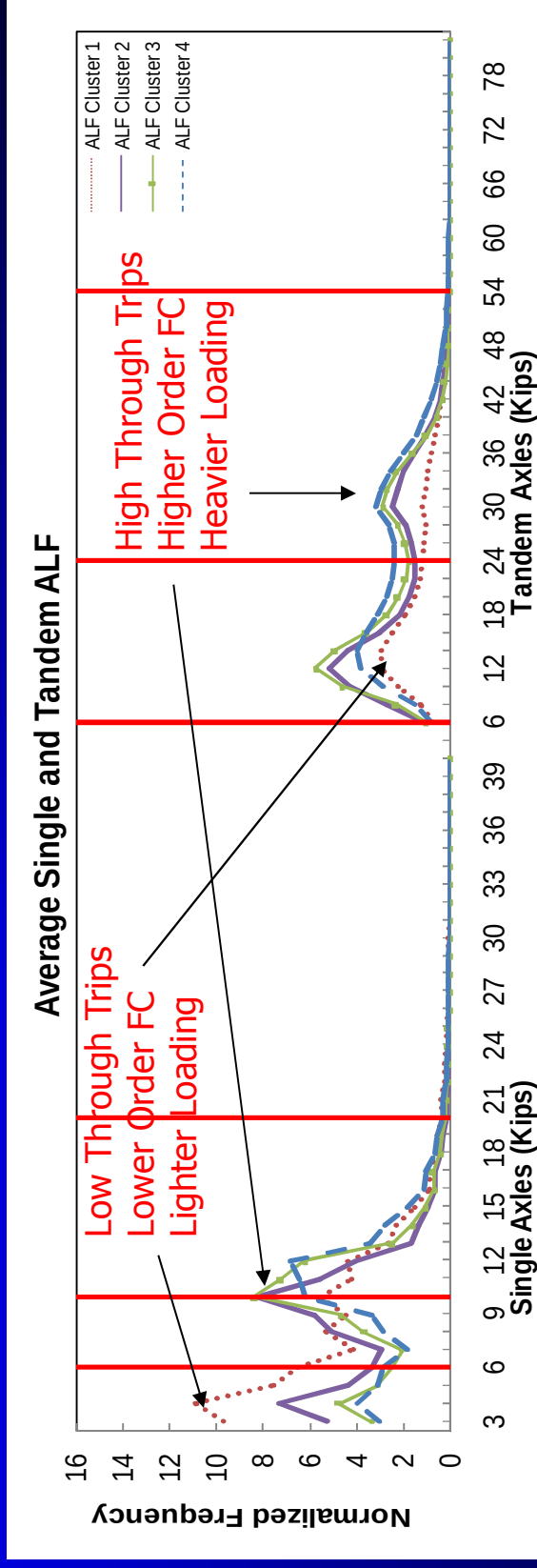
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CONTINUOUS WEIGHT MONITORING

Axle Load Factor Groups (ALF)

% of Axles (by type) in each weight range

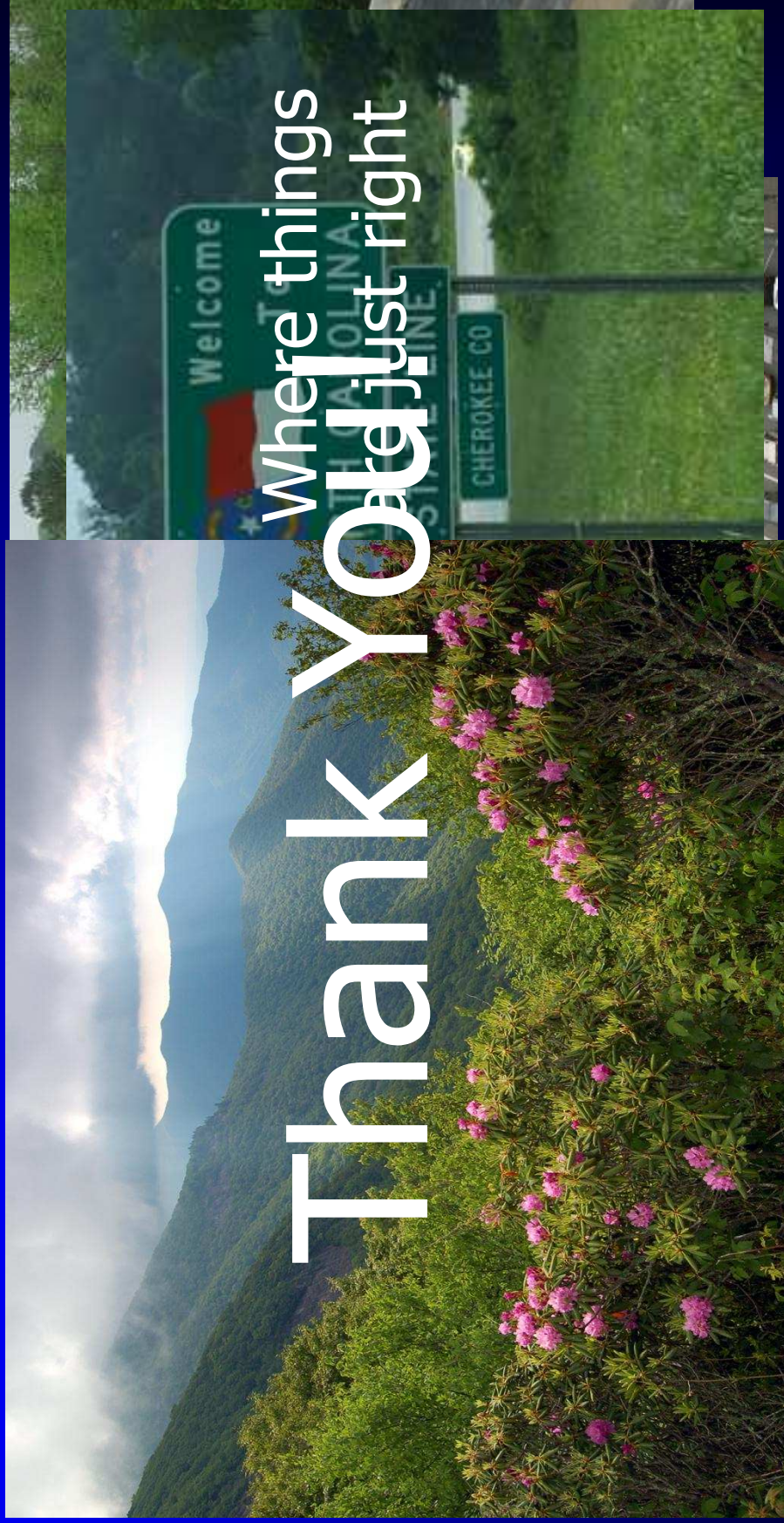


Axle Group Weight Ranges

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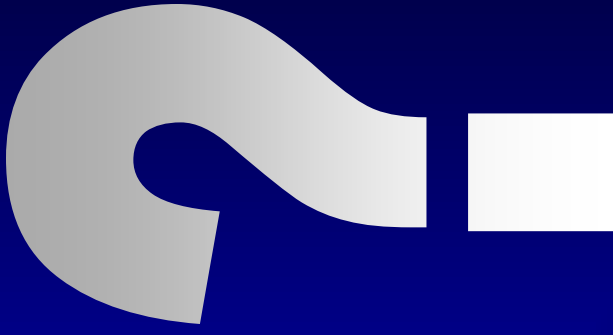
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MEPDG is on the way!



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RULES OF THUMB

- *K Factor ranges: Urban - 9 to 12 %, Rural - 11 to 16%, Recreational - 13 to 25+%*
- *Your base year traffic forecast should at least generate the maximum measured peak hour volume*
- *D usually varies as you move along a corridor*
- *D is fairly strong in fringe areas (60 to 65%)*
- *D tends to be more moderate in heavily urbanized areas (55 to 60%)*
- *Average the truck volumes collected at multiple locations*
- *Look at the numbers – Do they make sense?*