NATMEC 2016
Improving Traffic Data Collection, Analysis, and Use
May 1–4, 2016
Hyatt Regency Miami
400 SE Second Avenue, Miami, Florida 33131

Organized by
Transportation Research Board

Supported by
Federal Highway Administration, Office of Highway Policy Information

Hosted by
Florida Department of Transportation

www.NATMEC.org
NATMEC 2016—the North American Travel Monitoring Exposition and Conference—is the place to see the latest in traffic data collection equipment, learn about new tools to monitor traffic data quality, acquire new ideas on transforming existing data into new information, and understand the impacts of recent legislation and policy.

You are sure to discover new and helpful things that you can apply to your daily job—whether you are talking to vendors, sharing experiences with colleagues from public and private agencies, or attending one of the many presentations offered in the following six program areas:

- Transportation Policy, Management, and Communications
- Performance Measures and Reporting
- Bike and Pedestrian Data
- Working with and Reporting of Traffic Data (Motorized Data)
- Traffic Data Collection and Processing (Motorized Data)
- Traffic Data Equipment and Technologies (Motorized Data)

Those who are only interested in Bicycle and Pedestrian Data can take advantage of a one-day registration since all Bike and Pedestrian sessions are on Tuesday, May 3.

Don’t miss NATMEC 2016 and the many opportunities to gain the knowledge and insight needed to bring your travel monitoring program to the next level.

—Mena Lockwood
Chair, NATMEC 2016 Planning Committee
Assistant State Traffic Engineer
Virginia Department of Transportation

Planning Committee
Mena Lockwood, Virginia Department of Transportation, conference chair
Andrea Bahoric, Pennsylvania Department of Transportation
Steven Bentz, Florida Department of Transportation
Scott Brady, Delaware Valley Regional Planning Commission
Edward Christopher, Consultant
Michael Fontaine, Virginia Transportation Research Council
Greg Griffin, Texas A&M Transportation Institute
Mark Hallenbeck, University of Washington
Jim Hubbell, Mid-America Regional Council
Danny Jenkins, Federal Highway Administration
Steven Jessberger, Federal Highway Administration
Ken Lakey, Washington State Department of Transportation
Min Tang Li, Florida Department of Transportation
Erik Minge, SRF Consulting Group
Christopher Monsere, Portland State University
William Morgan, Illinois Department of Transportation
Andrew Nichols, Marshall University
Jeffrey Short, American Transportation Research Institute
Eileen Singleton, Baltimore Metropolitan Council
Penelope Weinberger, American Association of State Highway and Transportation Officials

TRB Staff
Thomas Palmerlee, Assistant Division Director
Mai Quynh Le, Associate Program Officer
The City of Miami

A major international port and gateway for global industries, the City of Miami was incorporated in 1896. From its early Native American settlers, the Tequestas, to displaced American Indians who migrated to the area during the late 1700s, South Florida has a long and diverse history of residents. The first recorded landing by Spanish explorers was in 1566. European settlement was slow until 1842, when William English charted the “Village of Miami” and established it on the south bank of the Miami River. Julia Tuttle, a wealthy widow from Ohio, purchased a large citrus plantation and worked to establish rail access to Miami. In 1896, the railroad reached Miami and the city soon became a tourist attraction and retreat for the wealthy.

Miami has since become the headquarters for many multinational companies and financial institutions, and has the largest concentration of international banks in the country. It still serves as a vacation area for the rich and famous, but also ranks as one of the top poorest cities in the country.

Adapted from http://www.miamigov.com/home/history.html.
### SCHEDULE OF EVENTS

<table>
<thead>
<tr>
<th>Event</th>
<th>Day</th>
<th>Start Time</th>
<th>End Time</th>
<th>Location</th>
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<tbody>
<tr>
<td>Arterial Data and Performance Monitoring Workshop</td>
<td>Sunday</td>
<td>1:00 PM</td>
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<tr>
<td>Traffic Data Visualization Workshop</td>
<td>Sunday</td>
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<tr>
<td>Assessment of In- and Outsourcing Practices for Traffic Monitoring Data Collection Workshop</td>
<td>Sunday</td>
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<tr>
<td>Pooled Fund: Axle and Length Class Factor Analysis and Effects on AADT</td>
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<tr>
<td>NATMEC Planning Committee</td>
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<tr>
<td>Exhibit Opening and Reception</td>
<td>Saturday</td>
<td>5:30 PM</td>
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<td>Regency Ballroom</td>
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<tr>
<td>TRB Travel Time, Speed, and Reliability Subcommittee, ABJ30(3)</td>
<td>Monday</td>
<td>7:15 AM</td>
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<tr>
<td>Opening Session</td>
<td>Monday</td>
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<td>10:00 AM</td>
<td>Jasmine</td>
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<tr>
<td>Exhibits</td>
<td>Monday</td>
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<tr>
<td>TRB Urban Transportation Data and Information Systems, ABJ30(3)</td>
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<td>12:15 PM</td>
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<td>Regency Ballroom</td>
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<tr>
<td>Analysis of Truck Freight Data</td>
<td>Monday</td>
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<tr>
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<td>Using Data Analytics and Visualization to Support Transportation Planning and Operations</td>
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<td>Diving into the Value and Cost of Time: Is Time Valuable?</td>
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<td>Traffic Data for Public Use</td>
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<tr>
<td>Best Practices in Processing NPMRDS Data for State and Local Performance Measures</td>
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<tr>
<td>TRB Bike and Pedestrian Subcommittee, ABJ35 (3)</td>
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<td>Pooled Fund: Web Based Traffic Data Visualization and Analysis Tools &amp; National Performance Measures Research Data Set (NPMRDS) Overview</td>
<td>Monday</td>
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<td>ASTM Meeting on Axle Classification</td>
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<tr>
<td>TRB Weigh-in-Motion Subcommittee, ABJ35 (2)</td>
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<tr>
<td>Data- Driven Decision Making: Using Data to Evaluate and Improve Our System Technology</td>
<td>Tuesday</td>
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<td>Weigh-in-Motion (WIM) Technologies</td>
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<td>Lunch</td>
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<tr>
<td>Creating a Nonmotorized Counting Program</td>
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<td>Cooperating Counting Programs: Interagency Coordination</td>
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<td>Vehicle Counting and Classification</td>
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<td>Pushing the Envelope with Probe Data Beyond the Usual Performance Measures</td>
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<tr>
<td>New Approaches to Putting Your Data to Work</td>
<td>Tuesday</td>
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<tr>
<td>Applying Data for Decisions</td>
<td>Tuesday</td>
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<td>FHWA Pooled Fund: Assessing Roadway Traffic Count Duration and Frequency Impacts on Annual Average</td>
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<td>The Future is Now: Data from Connected Vehicles</td>
<td>Wednesday</td>
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<tr>
<td>Tools for Visualizing Traffic Data</td>
<td>Wednesday</td>
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<td>Intersections and Traffic Flow Monitoring</td>
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<tr>
<td>Closing Session</td>
<td>Wednesday</td>
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<td>Noon</td>
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<tr>
<td>Planning Committee</td>
<td>Wednesday</td>
<td>Noon</td>
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**Transportation Policy, Management, and Communications**

**Track Sessions**
- Reauthorization and Its Implications for Data (Monday 10:30 a.m.–noon)
- Diving into the Value and Cost of Time: Is Time Valuable? (Monday 4:00 p.m.–5:30 p.m.)
- Is There a Return on Investment Value to Data? (Tuesday 10:30 a.m.–noon)
- New Approaches to Putting Your Data to Work (Tuesday 4:00 p.m.–5:30 p.m.)

**Performance Measures and Reporting**

**Track Sessions**
- Using Data Analytics and Visualization to Support Transportation Planning and Operations (Monday 2:00 p.m.–3:30 p.m.)
- Data-Driven Decision Making: Using Data to Evaluate and Improve Our System (Tuesday 8:30 a.m.–10:00 a.m.)
- Pushing the Envelope with Probe Data Beyond the Usual Performance Measures (Tuesday 2:00 p.m.–3:30 p.m.)
- The Future is Now: Data from Connected Vehicles (Wednesday 8:30 a.m.–10:00 a.m.)

**Bike and Pedestrian Data**

**Track Sessions**
- Collection Technology (Tuesday 8:30 a.m.–10:00 a.m.)
- Creating a Nonmotorized Counting Program (Tuesday 10:30 a.m.–noon)
- Cooperative Counting Programs: Interagency Coordination (Tuesday 2:00 p.m.–3:30 p.m.)
- Applying Data for Decisions (Tuesday 4:00 p.m.–5:30 p.m.)

**Working with and Reporting of Traffic Data (Motorized Data)**

**Track Sessions**
- Traffic Database Design and Architecture (Monday 10:30 a.m.–noon)
- Analysis of Truck Freight Data (Monday 2:00 p.m.–3:30 p.m.)
- Traffic Data for Public Use (Monday 4:00 p.m.–5:30 p.m.)
- Tools for Visualizing Traffic Data (Wednesday 8:30 a.m.–10:00 a.m.)

**Traffic Data Collection and Processing (Motorized Data)**

**Track Sessions**
- Probe Data Collection and Accuracy (Monday 10:30 a.m.–noon)
- Best Practices in Processing NPMRDS Data for State and Local Performance Measures (Monday 4:00 p.m.–5:30 p.m.)
- Innovations in Traffic Data Collection and Processing (Tuesday 10:30 a.m.–noon)
- Processing, Analysis and Application of Weigh-in-Motion (WIM) Data (Tuesday 4:00 p.m.–5:30 p.m.)

**Traffic Data Equipment and Technologies (Motorized Data)**

**Track Sessions**
- Probe Data Collection Using Bluetooth, WiFi, and Inductive Loop Signatures (Monday 2:00 p.m.–3:30 p.m.)
- WIM Technologies (Tuesday 8:30 a.m.–10:00 a.m.)
- Vehicle Counting and Classification (Tuesday 2:00 p.m.–3:30 p.m.)
- Intersections and Traffic Flow Monitoring (Wednesday 8:30 a.m.–10:00 a.m.)

Presentations will be posted on the conference website within two weeks.
ADVANCE WORKSHOPS

Open to all registrants. Subject to capacity limits.

Sunday, May 1

1:00 p.m.–4:30 p.m.

Traffic Data Visualization, Hibiscus B
Jim Hubbell, Mid-America Regional Council, presiding

While the idiom “a picture is worth a thousand words” is believed to have been coined in the early 1900s, the notion of using visualization to convey ideas and information has existed throughout human history. Visualization provides an opportunity to convert traffic data, whether one thousand or one billion records, into information that tells a story about the transportation system. The process of telling a good story with data requires a combination of creative and technical skills (that is, art and science), and it is important for transportation professionals to understand and master both areas.

Panelists
Michael L. Pack, CATT Laboratory, University of Maryland
Catherine Lawson, Albany Visualization and Informatics Lab (AVAIL), University at Albany, SUNY

Arterial Data and Performance Monitoring, Hibiscus A
Stanley Young, National Renewable Energy Laboratory; Shawn M. Turner, Texas A&M Transportation Institute (TTI), presiding

This workshop will examine the data, tools, and performance measures available to assess the quality of traffic flow on signal-controlled roadways. A continuation of the 2014 workshop, these sessions will stress the tools and technologies that have come online in the interim. The technologies include reidentification data (Bluetooth and WiFi), outsourced probe data, and high-resolution controller data. Although technology enabled, the workshop’s goal is to present use cases and gain consensus from participants on recommended practices moving forward.

Assessment of In- and Outsourcing Practices for Traffic Monitoring Data Collection, Orchid C
Steven Jessberger, Federal Highway Administration (FHWA); Murat Omay, Battelle, presiding

The FHWA–Office of Highway Policy Information is conducting research to assess the advantages and disadvantages that state departments of transportation (DOTs), metropolitan planning organizations (MPOs), and local agencies experience by insourcing or outsourcing traffic data collection activities under three categories; equipment installation, traffic data collection, and innovative contracting practices. This research will document the advantages and disadvantages of in– and outsourcing practices (fully, partially, or hybrid of the two) of a variety of traffic monitoring activities, equipment installation practices, and other innovative contracting methods such as data or equipment exchange agreements, using ITS devices to collect traffic data, etc.
COMMITTEE MEETINGS

Meetings are open to all attendees, except where noted.

Monday, May 2

7:15 a.m.–8:15 a.m.
**TRB Travel Time, Speed, and Reliability Subcommittee, ABJ30(3), Orchid C**
Michael Fontaine, Virginia Transportation Research Council, *presiding*

12:15 p.m.–1:45 p.m.
**TRB Urban Transportation Data and Information Systems, ABJ30, Orchid C**
Michael Fontaine, Virginia Transportation Research Council; Kristin Tufte, Portland State University, *presiding*

5:30 p.m.–7:00 p.m.
**TRB Bike and Pedestrian Data Subcommittee, ABJ35(3), Orchid C**
Scott Brady, Delaware Valley Regional Planning Commission, *presiding*

Tuesday, May 3

7:15 a.m.–8:15 a.m.
**TRB Weigh-in-Motion Subcommittee, ABJ35(2), Orchid C**
Jonathan Regehr, University of Manitoba, *presiding*

12:15 p.m.–1:45 p.m.
**TRB Highway Traffic Monitoring, ABJ35, Orchid C**
Jonathan Regehr, University of Manitoba; Elizabeth Stolz, Ready4Wellness, *presiding*

Pooled Fund:  **Axle and Length Class Factor Analysis and Effects on Annual Average Daily Traffic (AADT), Orchid D**
Susie Forde, Wisconsin Department of Transportation, *presiding*

Monday, May 2

5:30 p.m.–7:30 p.m.
**Pooled Fund: Web–Based Traffic Data Visualization and Analysis Tools and National Performance Measures Research Data Set (NPMRDS) Overview, Orchid B**
Danny Jenkins, Federal Highway Administration, *presiding*

Tuesday, May 3

7:15 a.m.–8:15 a.m.
**ASTM Meeting on Axle Classification, Orchid B**
Steven Jessberger, Federal Highway Administration, *presiding*

5:30 p.m.–6:30 p.m.
**FHWA Pooled Fund: Assessing Roadway Traffic Count Duration and Frequency Impacts on Annual Average, Orchid B**
Steven Jessberger, Federal Highway Administration, *presiding*
SESSIONS

Sunday, May 1

5:30 p.m.–7:30 p.m.
Exhibit Opening and Reception, Regency Ballroom
For more information, e-mail TRBMeetings@NAS.edu or visit www.NATMEC.org.

Poster Session: Bike and Pedestrian Data: Data Wrangling and Access

  Development of QA/QC Processes for Bicycle and Pedestrian Data
  Kristy Jackson, Sarah Searcy, ITRE, North Carolina State University
  Steps Toward a National Nonmotorized Traffic Count Archive
  Krista Nordback, Kristin Tufte, Portland State University
  Relating Automatic Bicycle Traffic Volume Counts with Detection of Cyclists Enrolled in Bicycling Reward Program
  Yilun Xu, University of Minnesota
  Using Temporal Patterns of Bicycle and Pedestrian Traffic to Define Factor Group
  Steve Hankey, Tianjun Lu, School of Public and International Affairs, Virginia Tech
  Snapping Locational Point Data to Large Street Network Using Adjacency Matrix Approach: A Case Study based on Cycle Atlanta Data
  Aditi Misra, Georgia Institute of Technology; Aaron Greenwood, Georgia Institute of Technology

Poster Session: Performance Measures and Reporting-Arterial Performance Measures

  Which Factors Affect Congestion Performance Measures in Arterial Networks, and How Much? A Case Study from Virginia
  Ramkumar Venkatanarayana, Virginia Department of Transportation
  Travel Time Reliability Monitoring Based on Multisensor Data
  Xu Zhang, Mei Chen, University of Kentucky
  Evaluating Signal Performance Using High-Resolution Event-Based Data
  Chengchuan An, Yao-Jan Wu, Amin Ariannezhad, University of Arizona

Poster Session: Traffic Data Collection Programs Measures

  Surveys and Modeling of Dallas–Fort Worth Metroplex Commercial Vehicle and Workplace Trips
  Zhen Ding, Arash Mirzaei, North Central Texas Council of Governments
  Complete History of Weigh-in-Motion
  Wiley Cunagin, Atkins
  Calculating Statistical Patterns of Traffic Counts in the Dallas-Fort Worth Metropolitan Area
  Francisco Torres, Arash Mirzaei, North Central Texas Council of Governments
  Surveys and Modeling of Dallas-Fort Worth Metroplex Commercial Vehicle and Workplace Trips
  Zhen Ding, Arash Mirzaei, North Central Texas Council of Governments
  Comparing Various State DOT Approaches to Short-Term Data Collection
  Susie Forde, Wisconsin Department of Transportation; Ronald Bunting, Iowa Department of Transportation; Aaron Moss, Colorado Department of Transportation
  Turning Snowplow Trucks into Data-Collection Platforms
  Hazem Refai, University of Oklahoma; Alan Stevenson, Oklahoma Department of Transportation
  Automating Quality Control for Urban Traffic Data
  Rob Poapst, Garreth Rempel, MORR Transportation Consulting
  A Traffic Count File Format for Recording Moving Objects
  Dan Seedah, Stephen Cropley, Transmetric America Inc.
Travel Time and Congestion Analysis Corrections Using Global Navigation Satellite System and GIS Along Cycle Track Network in Calgary’s Downtown Core
Wendy Pan, The City of Calgary

Poster Session: General

Collaborative Decision-Making Tools for Significant Event Coordination
Nikola Ivanov, University of Maryland CATT Laboratory

Reporting: Meaningful Traffic Characteristics
Malwina Splawinska, Cracow University of Technology

IRD Vectorsense™ Technology: Enhancing Existing Traffic Information Systems
Randy Hanson, Roy Czinku, International Road Dynamics

Vehicle Counting and Classifying Not Using Road Tubes
Hasan Tafish, University of Oklahoma; Walid Balid, University of Oklahoma

HS-WIM Sensor Performance for Precision Weigh-in-Motion Applications
Kai Kroll, Karl Kroll, Intercomp Company

Bicycle Infrastructure Rating Using the Low Stress Method: A Tale of Two Cities
Maaza Mekuria, Hawaii Department of Transportation

Low-Profile Microwave Radar and Wi-Fi Scanners for Visually Unobtrusive Vehicle Detection and Travel Time Monitoring
Xiaoliang (George) Zhao, Pan Gao, Intelligent Automation, Inc

Feasibility of Using Crowdsourced Probe Vehicle Data for Urban Arterial Performance Monitoring
Xu Zhang, Mei Chen, University of Kentucky

Improved Annual Average Daily Traffic (AADT) Estimation Processes
Steven Jessberger, Federal Highway Administration; Robert Krile, Jeremy Schroeder, Frederick Todt, Battelle; Jingyu Feng, Zions Bancorporation
**Monday, May 2**

8:30 a.m.–10:00 a.m.  
**Opening Session, Jasmine**  
Mena Lockwood, Virginia Department of Transportation, Conference Chair, **presiding**

**Welcome to Florida**  
Debora Rivera, P.E., Florida Department of Transportation  

**Putting the Power of Data to Work for Our People and Business**  
Tianjia Tang, Chief, Travel Monitoring and Surveys, Federal Highway Administration  

**Data Implications in an Era of Transformational Technologies**  
Mark Norman, Director, Development & Strategic Initiatives, Transportation Research Board

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10:00 a.m.–4:00 p.m.  
**Exhibits and Posters, Breaks and lunch served in Regency Ballroom**

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10:30 a.m.–noon  
**Probe Data Collection and Accuracy (Traffic Data Collection and Processing), Jasmine**  
Jeffrey Short, American Transportation Research Institute, **presiding**  
Andrew Nichols, Marshall University, **recording**

Probe data changed the way transportation professionals measure and report on traffic flow, but there are still many unknowns. This session will provide insight into how probe data are collected, including a new way that the data can be collected to preserve privacy. Techniques for processing the data and evaluations of their accuracy also will be addressed.

**Probe Data: Opening the Black Box**  
Neil Ternowetsky, Chao Bian, MORR Consulting

**Implausible Ignorability: An Analysis of Factors Influencing Probe Vehicle Data Completeness**  
Yinhai Wang, Kristian Henrickson, University of Washington

**The Transportation Secure Data Center: Enabling Research with High-Precision Personal GPS Data in a Way that Protects Participant Privacy**  
Stanley Young, Jeff Gonder, National Renewable Energy Laboratory

10:30 a.m.–noon  
**Reauthorization and Its Implications for Data (Transportation Policy, Management, and Communications), Hibiscus B**  
Ysela Llort, Former Director of Miami Dade County Transit, **presiding**  
Edward Christopher, Consultant, **recording**

Every time Congress passes a transportation bill, it not only provides funding for our transportation system but also brings varying degrees of programmatic additions, changes, and tweaks—all of which that have implications for the data that we collect, analyze, and present. This session will feature a panel of data and policy experts who will dissect the speaking to the data implications for travel monitoring community.

**Panelists**  
Tianjia Tang, Federal Highway Administration  
Penelope Weinberger, American Association of State Highway and Transportation Officials  
Carl Mikyska, Florida Metropolitan Planning Organization Advisory Council

10:30 a.m.–noon  
**Traffic Database Design and Architecture (Working with and Reporting of Traffic Data), Hibiscus A**  
Mecit Cetin, Old Dominion University, **presiding**  
Jim Hubbell, Mid-America Regional Council, **recording**

The use of centralized computer systems for collecting, managing, and disseminating data has been a standard practice for many agencies. As these databases continue to grow in size and complexity, there are opportunities to improve their efficiency and effectiveness. This session will include presentations about the design and architecture of traffic databases varying in size, data type, and intended user.
2:00 p.m.–3:30 p.m.
**Probe Data Collection Using Bluetooth, Wi-Fi, and Inductive Loop Signatures** *(Traffic Data Equipment and Technologies)*, **Jasmine**
Michael Fontaine, Virginia Transportation Research Council, *presiding*
William Morgan, Illinois Department of Transportation, *recording*

Many agencies now regularly use probe data collection systems to supplement traditional sensors, but probe technologies are changing rapidly. This session will discuss several emerging methods to collect probe data and will explore the potential to improve data quality. A comparison of the technologies and appropriate applications will be included.

- **Investigation of Wi-Fi Sensing Technologies on Arterials**
  Noah Goodall, Michael Fontaine, Virginia Center for Transportation Innovation and Research

- **Bluetooth Versus Wi-Fi for MAC Address Data Collection**
  Darryl Puckett, Mike Vickich, Texas A&M Transportation Institute

- **Improve Traffic Data Collection with Inductive Loop Signature Technology**
  Lianyu Chu, Cindy Jeng, CLR Analytics Inc.

2:00 p.m.–3:30 p.m.
**Using Data Analytics and Visualization to Support Transportation Planning and Operations** *(Performance Measures and Reporting)*, **Hibiscus B**
Eileen Singleton, Baltimore Metropolitan Council, *presiding*
Mark Hallenbeck, University of Washington, *recording*

Now that we have so much available transportation data, how can we use it effectively to meet MAP-21 targets and support planning and operations without being overwhelmed? This session explores the tools being used to integrate, analyze, and visualize large datasets to enable more effective decision making for system planning and operations.

- **MAP-21 Visual Analytics to Support Performance Reporting**
  Nikola Ivanov, Michael Pack, University of Maryland CATT Laboratory

- **The I-4 Ultimate Dashboard: The Bridge Between Transportation Planning and Operations**
  Melissa Gross, Keith Smith, VHB

- **Performance Management Tools: Success Stories and Lessons Learned**
  Anita Vandervalk-Ostrander, Cambridge Systematics, Inc.

2:00 p.m.–3:30 p.m.
**Analysis of Truck Freight Data** *(Working with and Reporting of Traffic Data)*, **Hibiscus A**
Danny Jenkins, Federal Highway Administration, *presiding*
Andrew Nichols, Marshall University, *recording*

The amount of freight transported by truck continues to grow, as does the need for agencies to monitor and understand this activity across their entire network. Agencies frequently do not have sufficient sensors on all network segments to directly measure the activity, so, estimations must be derived from other segments or sources of data. This session will cover aspects of truck freight data analysis, including truck pattern grouping and commodity flow estimation.

- **Development of Traffic and Truck Traffic Pattern Groups for the Primary Road Network in Costa Rica**
  Henry Hernández-Vega, LanammeUCR; Javier Magana-Cubillo, Universidad de Costa Rica

- **Integrating Axle Configuration, Truck Body Type, and Payload Data to Estimate Commodity Flows**
  Kristopher Maranchuk, Jonathan Regehr, University of Manitoba, Canada

- **Freight Management Support System Based on the Practical Implementation Realized Under the Opti’Cities Project**
  Piotr Bardadyn, Neurosoft Sp.
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Best Practices in Processing NPMRDS Data for State and Local Performance Measures (Traffic Data Collection and Processing), Jasmine
Steven Jessberger, Federal Highway Administration, presiding
Andrea Bahoric, Pennsylvania Department of Transportation, recording

The NPMRDS, which is available to all states and MPOs, offers a great opportunity for many agencies, but also raises questions as to comprehensiveness and accuracy. This session will examine the NPMRDS data compared to other traffic data sources and present examples of how agencies are using these data for performance reporting.

Comparison of Statewide Single-Source and Regional Multisource Traffic Speed Data Sets in the Austin, Texas, Region
Matthew Miller, Texas A&M Transportation Institute

Using NPMRDS to Analyze and Report Traffic Performance at the Dallas-Fort Worth Metropolitan Area
Francisco Torres, Hong Zheng, North Central Texas Council of Governments

Leveraging Speed and Travel-Time Measurement Data in Traffic Performance Analysis
Naim Bitar, Hazem Refai, The University of Oklahoma

Comparison of Permanent Count Data with the NPMRDS Probe Data
Maaza Mekuria, Hawaii Department of Transportation

NPMRDS: A National Perspective
Jeffrey Short, American Transportation Research Institute

4:00 p.m.–5:30 p.m.
Diving into the Value and Cost of Time: Is Time Valuable? (Transportation Policy, Management, and Communications), Hibiscus B
Penelope Weinberger, American Association of State Highway and Transportation Officials, presiding
Danny Jenkins, Federal Highway Administration, recording

Travel time, reliability, and analysis are increasingly being used to inform decisions. Questions arise, however, about how to present and report the metrics when dealing with thousands of vehicles traversing both time and space. Intertwined with the scientific measurement questions are the perceptions of the traveling public. This session will begin to explore these issues from three slightly different, but interrelated, perspectives.

User Delay Cost Dilemma and Solution
Reuben Juster, CH2M; Stanley Young, National Renewable Energy Laboratory

Identification and Analysis of Composite Travel Time Distributions in a Traffic Stream Utilizing Probe Vehicle Data
Angshuman Guin, Georgia Institute of Technology; James Anderson, AECOM

Value of Travel Time Reliability and its Use in Transportation Decision Making: A Data-Driven Approach
Kaveh Sadabadi, Tom Jacobs, University of Maryland CATT; Sevgi Erdogan, Fred Ducca, University of Maryland NCSG; Subrat Mahapatra, Maryland State Highway of Administration

4:00 p.m.–5:30 p.m.
Traffic Data for Public Use (Working with and Reporting of Traffic Data), Hibiscus A
Christopher Zajac, New Jersey Department of Transportation, presiding
Jim Hubbell, Mid-America Regional Council, recording

As the available methods for agencies to communicate travel information to the public grow and improve, so does the public’s reliance on this information to make daily decisions. The sources of traffic data also continues to evolve, providing new opportunities for agencies. This session will present examples of converting transportation data into information for the direct use by the public, primarily for decision-making purposes.

Dangerous Road Congestion Alert Technology
Weimin Huang, HERE

Real-Time Traffic Data for Streamlined Movement During Roadway Construction
Mark Dykstra, Andrew Locke, TomTom
Using Probe Vehicle Data to Improve Work Zone Safety and Mobility
Nikola Ivanov, John Allen, University of Maryland CATT Laboratory
Flexible Transit Commute & Trip Planning
Kristin Tufte, Parker Emerson, Portland State University

Tuesday, May 3

8:30 a.m.—10:00 a.m.
**Weigh-in-Motion (WIM) Technologies** *(Traffic Data Equipment and Technologies)*, Jasmine
Ken Lakey, Washington State Department of Transportation, *presiding*
Steven Bentz, Florida Department of Transportation, *recording*

WIM data collection is common nationwide. Data from state installed WIM field equipment are used by the federal government all the way down to local city and county government offices. This session will detail some of the best practices of WIM calibration, some new ideas, various types of sensors, and the value of accuracy.

**Strategies for Enhancing Field Calibration of Weigh-in-Motion Equipment**
Olga Selezneva, Dean Wolf, ARA; Deborah Walker, Federal Highway Administration

**Options for Providing Reliable Axle Load Data for Mechanistic-Empirical Pavement Design in Manitoba**
Steven Wood, Jonathan Regehr, University of Manitoba

**Weigh-in-Motion Station Monitoring and Calibration Using Inductive Loop Signature Technology**
Shin-Ting Jeng, Lianyu Chu, CLR Analytics Inc.

8:30 a.m.—10:00 a.m.
**Data-Driven Decision Making: Using Data to Evaluate and Improve Our System** *(Performance Measures and Reporting)*, Hibiscus B
Charles Lattimer, Atkins, *presiding*
Mena Lockwood, Virginia Department of Transportation, *recording*

As transportation data become more readily available, agencies are eager to use the opportunity to better understand their networks. More data, better integration of related data sets, and new tools offer novel opportunities to expand our insights. This session highlights three examples of effective data use to improve system evaluations and make better decisions.

**Using Travel Time Reliability Measures to Support Traffic Management and Operations**
Mohammed Hadi, Yan Xiao, Florida International University

**An Interactive, Scalable Before–After Evaluation of 95 Express HOT Lanes**
Yue Liu, Ramkumar Venkatanarayana, Benjamin Cottrell, Virginia Department of Transportation

**CMAP’s Experience with NPMRDS and Other Vehicle Probe Datasets**
Todd Schmidt, Chicago Metropolitan Agency for Planning

8:30 a.m.—10:00 a.m. 🚴‍♂️
**Collection Technology** *(Bike and Pedestrian Data)*, Hibiscus A
Min Tang Li, Florida Department of Transportation, *presiding*
Scott Brady, Delaware Valley Regional Planning Commission, *recording*

Nonmotorized travel modes are an increasingly important component of the transportation system. Interest at the federal, state, and local levels in the collection of data to understand the extent and characteristics of this travel is growing. This session explores some of the technologies, both established and emerging, employed to provide data to inform the decision-making and planning processes.

**Bicycle Counts Using Pneumatic Tubes**
Sirisha Kothuri, Krista Nordback, Portland State University

**Counting Bicycles and Pedestrians at Signalized Intersections**
Sirisha Kothuri, Krista Nordback, Portland State University

**Collecting Data at a Large Event**
Chris Hutchinson, TERRA Engineering

**Vision Based Automated Data Collection and Behavior Analysis of Active Modes of Transportation**
Tarek Sayed, Mohamed Zaki, University of British Columbia
10:30 a.m.–noon
**Innovations in Traffic Data Collection and Processing (Traffic Data Collection and Processing), Jasmine**
Andrew Nichols, Marshall University, *presiding*
Jeffrey Short, American Transportation Research Institute, *recording*

Transportation professionals are always interested in ways to improve data collection methods and decrease costs. This session looks at new and unique data collection and processing efforts for a variety of traffic data applications.

- **Investigating the Relationship Between Driving Patterns and Traffic Safety Using Smartphones-Based Mobile Sensor Data**
  Rajesh Paleti, Mecit Cetin, Old Dominion University
- **Predicting Traffic Profiles**
  David Vickers, Adam Van Horn, Southwest Research Institute
- **Travel Time Based on Vehicle Signatures**
  Hazem Refai, The University of Oklahoma; Alan Stevenson, Oklahoma Department of Transportation
- **Quality Assurance for Traffic Count Data in National Parks: Ensuring Quality when Traffic Variability is High**
  A.J. Nedzesky, National Park Service; Shawn Turner, Texas Transportation Institute

10:30 a.m.–noon
**Is There a Return on Investment Value to Data? (Transportation Policy, Management, and Communications), Hibiscus B**
Danny Jenkins, Federal Highway Administration, *presiding*
Edward Christopher, Consultant, *recording*

A variety of traffic and other related data collected in the course of our transportation planning, programming, and project selection. Little attention, however, is focused on our data from a return-on-investment perspective. This session focused on the importance, value, and return on investment of these data as they are used as an adjunct to the decision-making process.

- **Guidelines for the Day-to-Day Operation of a Traffic Monitoring Program**
  Kiisa Wiegand, Paul Tanner, Georgia Department of Transportation
- **State and Regional Data Business Plans: Taking It to the Next Level**
  Anita Vandervalk, Cambridge Systematics, Inc.
- **Florida’s Return on Investment from Data Collection**
  Wiley Cunagin, Atkins

10:30 a.m.–noon
**Creating a Nonmotorized Counting Program (Bike and Pedestrian Data), Hibiscus A**
Krista Nordback, Portland State University, *presiding*
Min Tang Li, Florida Department of Transportation, *recording*

The advent of automated data collection equipment facilitated the evolution from conducting manual counts limited in scope and duration to data collection programs. With precedents in the motorized data collection world, agencies are developing a systematic approach to the collection, storage, and dissemination of data. This session presents examples of efforts to design data collection programs.

- **Establishing a Bicycle Cyclical Counting Program in the Delaware Valley Region**
  Scott Brady, Cassidy Boulan, Delaware Valley Regional Planning Commission
- **Designing a Bicycle and Pedestrian Traffic Count Campaign in a Small Rural College Town**
  Steve Hankey, Tianjun Lu, School of Public and International Affairs, Virginia Tech
- **Pedestrian Traffic Monitoring Program Design in Central Business Districts**
  Rob Poapst, Keenan Patmore, MORR Transportation Consulting
- **Lessons Learned and Processes Created While Establishing a Nonmotorized Traffic Monitoring Program**
  Sarah O’Brien, Kristy Jackson, Institute for Transportation Research and Education
2:00 p.m.–3:30 p.m.  
**Vehicle Counting and Classification (Traffic Data Equipment and Technologies), Jasmine**  
William Morgan, Illinois Department of Transportation, *presiding*  
Ken Lakey, Washington State Department of Transportation, *recording*  

Agencies continue to look at options to handle counting and classification of vehicles in both free-flow and congested traffic patterns. This session will review several examples of how different technologies are being used to address these needs for both short term and continuous counting sites.

*Traffic Data Collection Program in the Middle East*  
George Gahreeb, Chris Hutchinson, TERRA Engineering  

*Transportation Data and GIS Office (TDGO), Traffic Data Collection Counting Process and Technologies Used*  
Dave Bushnell, Ken Lakey, Washington State Department of Transportation  

*Truck Count Project*  
Doug McIvor, Vahid Nowshiravan, California Department of Transportation; Andre Tok, University of Irvine, California

2:00 p.m.–3:30 p.m.  
**Pushing the Envelope with Probe Data Beyond the Usual Performance Measures (Performance Measures and Reporting), Hibiscus B**  
Jim Hubbell, Mid-America Regional Council, *presiding*  
Eileen Singleton, Baltimore Metropolitan Council, *recording*  

Vehicle probe data have undeniably revolutionized the field of transportation performance measurement. In addition to the myriad of performance measures, transportation professionals continue to use these data to develop innovative applications. This session will highlight an innovative methodology to calculate transit performance and will showcase research that uses probe data measures to evaluate the effectiveness of strategies and better understand complex travel patterns.

*Apples to Apples: Measuring the Performance of Transit and Roadways Equivalency*  
Reuben Juster, CH2M; Stanley Young, National Renewable Energy Laboratory  

*Estimating Mobility Improvement Benefits Using Private-Company Speed Datasets*  
David Schrank, Tim Lomax, Texas A&M Transportation Institute  

*Probe Based Origin-Destination Matrices: Revolutionizing Travel Demand Modeling and More*  
Monali Shah, Terri Johnson, HERE North America, LLC

2:00 p.m.–3:30 p.m.  
**Cooperative Counting Programs: Interagency Coordination (Bike and Pedestrian Data), Hibiscus A**  
Liz Stolz, Ready4Wellness, *presiding*  
Christopher Monsere, Portland State University, *recording*  

The implementation of nonmotorized data collection programs face many obstacles, including budgets and staffing. With limited resources, innovative partnerships between associated agencies can collect data effectively. Examples of some of these efforts are presented in this session.

*Bike and Pedestrian Data Collection in the Dallas–Fort Worth Region*  
Karla Weaver, North Central Texas Council of Governments  

*Lessons Learned from the FHWA Bicycle and Pedestrian Count Technology Deployment Pilot Project*  
Carl Sundstrom, University of North Carolina Highway Safety Research Center; Jeremy Raw, FHWA  

*Minnesota’s Bicycle and Pedestrian Counting Initiative: Local Agency Outreach*  
Erik Minge, SRF Consulting Group, Inc.; Greg Lindsey, University of Minnesota

4:00 p.m.–5:30 p.m.  
**Processing, Analysis, and Application of Weigh-in-Motion Data (Traffic Data Collection and Processing), Jasmine**  
Deborah Walker, Federal Highway Administration, *presiding*  
Steven Jessberger, Federal Highway Administration, *recording*  

WIM data are critical to any highway agency’s travel monitoring program, with a shared goal of improving accuracy and applying the information for better decisions. This session explores the collection of WIM data, processing those data to improve their accuracy, and the application of WIM data to evaluate pavement life.
Recent advances in data visualization and data analytics have opened many new avenues for agencies to gain additional benefits from their own data. New partnerships can help these advances be realized as traditional software and data-handling techniques are insufficient to perform the desired analysis. To help these new tools and partnerships come together, it is essential that the data community have some behind-the-door discussions to identify what analytics would be useful, how to forge new partnerships, what type of agreements need to be in place and, most of all, what staffing levels are needed. This session will feature an interactive panel discussion with experts interested in leading this new movement with those in attendance.

**Panelists**

Catherine Lawson, University at Albany
Michael Fontaine, Virginia Transportation Research Council
Mark E. Hallenbeck, University of Washington
William Morgan, Illinois Department of Transportation

The growing quantity of nonmotorized data provides a general perspective of travel by bicycle and pedestrian modes. It has also facilitated research applications to address specific questions that are location-, behavior-, or aspect-specific. Presentations examine how these data are applied to understand travel by non-motorized modes.

**Perceptions of Safety and Cycling Behavior Based on Traffic Data: Implications for Public Health and City Planning**

William Riggs, Anurag Pande, California Polytechnic University, San Luis Obispo

**The Effects of Weather on Urban Trail Use: A National Study**

Greg Lindsey, Alireza Erma, University of Minnesota

**Monitoring and Modeling Urban Trail Traffic: Validation of Direct Demand Models in Minneapolis, Minnesota and Columbus, Ohio**

Greg Lindsey, Jueyu Wang, University of Minnesota

**Analysis of Pedestrian and Bicycle Volume Data in Low-Income Communities in Los Angeles County, California**

Herbie Huff, Madeline Brozen, UCLA Institute of Transportation Studies
Wednesday, May 4

8:30 a.m.–10:00 a.m.

**Intersections and Traffic Flow Monitoring (Traffic Data Equipment and Technologies), Jasmine**

Erik Minge, SRF Consulting Group, *presiding*
Michael Fontaine, Virginia Transportation Research Council, *recording*

Traffic flow is continuously monitored through traffic cameras at intersections. This session will discuss recent advancements utilizing the resulting data to capture turning movement counts, which are becoming a prominent aspect of agency traffic data collection programs. Also included in this session is an example of the use of drones in collecting traffic data, as well as bike and pedestrian data for short-term counts.

- **Permanent Intersection Counting and Performance Monitoring**
  Jeffery Price, GRIDSMART Technologies, Inc.
- **High-Fidelity Data at Signalized Intersections: A Research Approach**
  Edward Smaglik, Anuj Sharma, Iowa State University; Sirisha Kothuri, Portland State University
- **Paving the Way for Capturing Traffic Flow Metrics with Drones**
  Gregory Jordan, William Kasper, Skycomp, Inc.

8:30 a.m.–10:00 a.m.

**The Future is Now: Data from Connected Vehicles (Performance Measures and Reporting), Hibiscus B**

Rich Taylor, Federal Highway Administration, *presiding*
Eileen Singleton, Baltimore Metropolitan Council, *recording*

Connected and autonomous vehicles are expected to bring tremendous change to the transportation industry, including the travel monitoring community. Data are already being collected from connected vehicle (CV) pilot projects currently taking place across the United States, and are available now. In this session, representatives from the private sector, public sector, and academia will discuss what types of CV data are available, what data are coming, how they can be used, and what we need to do to be ready to leverage them.

- **Data from Virginia Tech Transportation Institute Connected Vehicles Pilot**
  Mike Mollenhauer, Virginia Tech Transportation Institute
- **Private-Sector Perspective on Connected Vehicles Data, Standards**
  Jane MacFarlane, HERE
- **Using Connected Vehicle Data for Performance Management**
  Bob Frey, Tampa Hillsborough Expressway Authority
- **State DOT Perspective on Connected Vehicles Data, Standards**
  Matthew Smith, Michigan Department of Transportation

8:30 a.m.–10:00 a.m.

**Tools for Visualizing Traffic Data (Working with and Reporting of Traffic Data), Hibiscus A**

Christopher Monsere, Portland State University, *presiding*
Andrew Nichols, Marshall University, *recording*

Once traffic data have been collected and processed, it often is a challenge to turn these data into information that can easily be interpreted by the public or decision makers. Some visualizations require complex software and programming to create, while others can be created using open source tools that are readily available. This session will present various tools being used to visualize data for the purpose of management, reporting, and dissemination of transportation information.

- **The Challenge of Referencing Traffic Data Effectively**
  Kent Taylor, North Carolina Department of Transportation
- **Using Google® Applications to Develop Traffic Data Visualization Tools**
  Giuseppe Grande, Auja Ominski, University of Manitoba
- **Arterial Signal Data Visualization**
  Kristin Tufte, Hui Zhang, Portland State University
- **Virtual Weigh Station Data for Real-Time Enforcement and Data Analytics**
  Michael Pack, Nikola Ivanov, University of Maryland CATT Laboratory
10:30 a.m.–noon
**Closing Session, Jasmine**
Mena Lockwood, Virginia Department of Transportation, *presiding*

**Work Together to Deliver: FHWA Data and Information Framework**
David Winter, Director, Office of Highway Policy Information, Federal Highway Administration

**Key Issues from the Conference and Next Steps to Move the Traffic Monitoring Community Forward**
Mark E. Hallenbeck, Director, Transportation Research Center, University of Washington

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Noon–1:30 p.m.
**Planning Committee Debriefing (members only), Orchid C**
Mena Lockwood, Virginia Department of Transportation, *presiding*
AgileAssets is the leading global provider of integrated infrastructure asset management software. Our technologies optimize the decision making process, enabling clients to more effectively manage and maintain their transportation assets.

BlueMAC
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Display and demonstrate BlueMAC integrated server and cloud service software along with Bluetooth and WiFi data collection components used for roadside collection of travel time, origin/destination, delay and road alerts. Data is collected and displayed via web interface in real time. The fastest and most affordable source of reliable travel time.

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Cestel is a Slovenian bridge WiM system pioneered by Dr. Fred Moses, of the USA. A bridge WiM system was required by Slovenia’s position as a major Adriatic port and gateway into the European market from the south, requiring a broad network of WiM to defend the highway infrastructure.

CountingCars.com
www.CountingCars.com

CountingCars.com is an American manufacturer and online store that develops and sells durable, cost-effective transportation data collection equipment. We’ve created traffic counting products that simplify data collection and processing. We specialize in vehicle counting, tube counters, video traffic collection and counting, traffic data management, and vehicle detection equipment.

Digital Traffic Systems, Inc.
www.digitaltrafficsystems.com

Digital Traffic Systems, Inc. (DTS) is a Traffic Data Systems Integrator and Intelligent Transportation Systems provider specializing in roadside device installation, operations, maintenance, and support services. We provide complete support for all major assets including sensors, monitoring and display systems, design and installation, and on-call and preventive maintenance programs.

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www.diamondtraffic.com

Supplier of a complete range of traffic data recording equipment. Diamond Traffic manufactures specifically for the traffic data industry with the widest product line. We are committed to providing value to customers through quality products and service as a USA company.

EXHIBITORS
Booth 16
Eco-Counter
www.eco-counter.com
Marian Mithani
marian.mithani@eco-counter.com
Phone: 866-518-4404

Eco-Counter is a world leader in providing specialized automatic pedestrian and cyclist monitoring systems. Using advanced sensor technologies, our systems can classify users in both urban and natural areas, and for both temporary and permanent count locations. More than 8,000 Eco-Counter systems have been installed in over 40 countries worldwide.

Booth 37
Florida Department of Transportation: Transportation Statistics
www.dot.state.fl.us/planning/statistics/
Ed Hutchinson
ed.hutchinson@dot.state.fl.us
Phone: 850-414-4910

The Transportation Statistics Office is the FDOT’s central clearinghouse and principal source for highway and traffic data.

Booth 23
Gewalt Hamilton Associates, Inc
www.gha-engineers.com
Arthur Penn
apenn@gha-engineers.com
Phone: 847-478-9700

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Gary Carter
gary@greatertraffic.com
Phone: 678-524-8489

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Booth 22
GRIDSMART Technologies, Inc.
www.gridsmart.com
Lauren Jochum
lauren.jochum@gridsmart.com
Phone: 865-466-3860

An easy to implement solution for traffic managers to use one technology to visually assess real-time traffic concerns and access long-term vehicle counts and performance data. GRIDSMART uses a single fisheye camera, single wire system that provides a horizon-to-horizon-view. This approach gives the user flexible and complete data collection capabilities, as well as unmatched situational awareness and incident management views.

Booth 14
Intercomp Company
www.intercompcompany.com
Jon Arnold
jona@intercompcompany.com
Phone: 763-476-2531

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Booths 6 and 7
International Road Dynamics Inc.
www.irdinc.com
Donna Bergan
donna.bergan@irdinc.com
Phone: 306-653-6600

IRD is a Highway Traffic Management Products and Systems Technology Company, operating in the ITS Industry. Experts in advanced technologies to detect and weigh vehicles at highway speeds, the integration of these and other complementary ITS Technologies into systems designed to solve traffic problems and in supplying custom designed systems.
Booths 3 and 4
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Kelly Cupps
kelly@jamartech.com
Phone: 800-776-0940
JAMAR Technologies manufacturers and distributes a wide variety of equipment for bicycle and pedestrian data collection. This includes temporary counts with road tubes, radar and infrared, as well as permanent locations with loops and piezoes. JAMAR also provides a full line of automotive traffic data collection equipment. E-mail us at sales@jamartech.com.

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Booth 8
MetroCount USA
www.metrocount.com
Patrick Corridon
pcorridon@metrocount.com
Phone: 800-567-5692
MetroCount® is a world leader in the design and manufacture of MetroCount vehicle traffic counting/classifying equipment and software. We are the major current supplier to the vehicle classification market including local councils, department of transports, main roads authorities and sub contractors.

Booth 31
Mikros Systems (Pty) Ltd
www.mikros.co.za
Marisa Fortune
marisa@syntell.co.za
Phone: 721-204-6352
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Booth 26
Sierzega Elektronik GmbH
www.sierzega.com
Jürgen Huber
j.huber@sierzega.com
Phone: +43 7221-64114-0
Sierzega Elektronik GmbH is an Austrian company that manufactures Radar Speed Displays and Radar Traffic Counters.

Booth 25
Southern Traffic Services, Inc.
www.southerntrafficservices.com
Jim Neidigh
jneidigh@southerntrafficservices.com
Phone: 512-818-3804
STS is a traffic engineering and transportation planning firm, which specializes in traffic data collection, traffic studies, and construction and maintenance services for Permanent Traffic Monitoring Sites. Established in 1988, STS continues to be recognized as a leader in our industry by providing our customers with accurate, dependable, traffic data collection and analysis.

Booth 17
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Donald Halvorsen
don.halvorsen@meas-spec.com
Phone: 757-766-4405
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The Traffic Group, Inc.
www.trafficgroup.com

John Blair
jblair@trafficgroup.com
Phone: 410-931-6600

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Booths 35 and 36
TimeMark Incorporated
www.TimeMarkInc.com

Daniel Gossack
danielg@timemarkinc.com
Phone: 503-363-2012

TimeMark builds and sells portable traffic data collection equipment and software using road tube and timestamp event recording.

Booth 13
Transmetric America Inc
www.transmetric.com

Jim Bryson
jim.bryson@transmetric.com
Phone: 512-906-9595

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Contacts
Thomas M. Palmerlee, TPalmerlee@nas.edu
Mai Q. Le, MQLe@nas.edu

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