

# Active Transportation And Demand Management



U.S. Department of Transportation  
Federal Highway Administration

## ACTIVE TRANSPORTATION AND DEMAND MANAGEMENT WEBINAR SERIES

# Webinar #3: Ramp Metering Benefits, Opportunities, and Keys for Overcoming Common Challenges

December 10, 2014

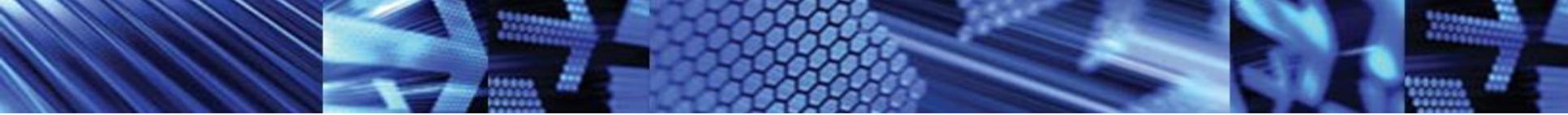


U.S. Department of Transportation  
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# Agenda

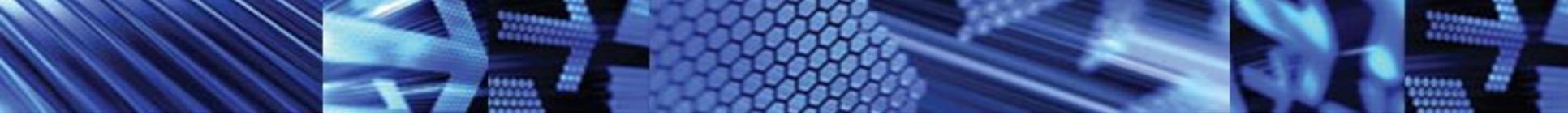
- Housekeeping
- Introduction
- Overview of Active Transportation and Demand Management (ATDM)
- Overview of Ramp metering
- Practitioner panel
- Open discussion





# HOUSEKEEPING





Nick Thompson

# INTRODUCTION



# Purpose of Today's Webinar



- Increase awareness
- Provide general information
- Provide resources and technical assistance to agencies new to ramp metering, agencies considering expanding or upgrading their ramp metering program



# ATDM Webinar Series

- This is the third in a series of ATDM webinars
- Topics based on **what matters most to you!**
- Upcoming ATDM webinars:
  - Traffic Management Capability Maturity Framework (Jan 2015)
  - ADM Part II (Feb 2015)
- Completed Webinars
  - October 22, 2014: Active Demand Management  
<https://connectdot.connectsolutions.com/p6byoty6abj/>
  - November 18, 2014: Active Traffic Management (ATM) Feasibility Study  
<https://connectdot.connectsolutions.com/p34emklqwvh/>



*Improving the  
Performance of  
the Transportation  
Industry Through  
Training*



# Today's Speakers



**James Colyar**  
*Transportation  
Specialist, FHWA  
Office of Operations*



**Nick Thompson**  
*Managed Lane and  
ITS Lead, Parsons  
Brinckerhoff*



**Les Jacobson**  
*Senior ITS Manager,  
Parsons  
Brinckerhoff*



# Practitioner Panel



**Mark Leth**  
*Assistant Regional  
Administrator - Traffic,  
Washington State DOT*



**Brian Kary**  
*Freeway Operations  
Engineer, Minnesota  
DOT*



**Jason Sims**  
*Traffic Center Manager  
Kansas City SCOUT,  
Missouri DOT*

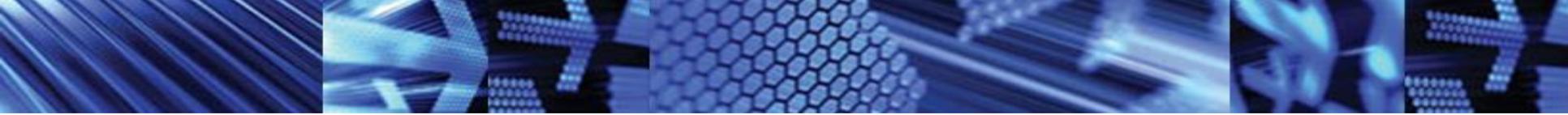


**Javier Rodriguez**  
*ITS Operations  
Engineer, Florida DOT*



**Meredith McDiarmid**  
*State Systems Operations  
Engineer, North Carolina  
DOT*





James Colyar

# OVERVIEW OF ATDM



# What is Active Management?

The fundamental concept of taking a dynamic approach to a performance based process



# Moving Towards Active Management

**Transportation Agency Operators:**  
Moving from Static to Proactive Management

- High complexity, high reward
- Emerging

- Low risk
- Proven

**Proactive Management**

- Respond to predicted changes in supply & demand
- Ability to delay or eliminate breakdowns

**Responsive Management**

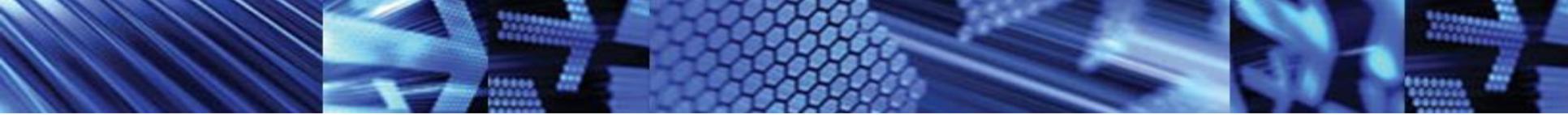
- Respond to current conditions
- Account for traffic impacts due to conditions
- Reduce time of degraded operation

**Static Management**

- Time of day
- Set-it and forget it
- Will work when there is limited variability

**Actively Managing Operations**





## Goal of ATDM Concept

- Attain the capability to dynamically monitor, control, and influence travel, traffic, and facility demand of the entire transportation system and over a traveler's entire trip chain.



# What does ATDM include?



**Active Demand Management (ADM):** A suite of strategies intended to reduce or redistribute travel demand to alternate modes or routes. Incentivizes drivers by providing rewards for travelling during off peak hours with less traffic congestion.



**Active Traffic Management (ATM):** A suite of strategies that actively manage traffic on a facility.

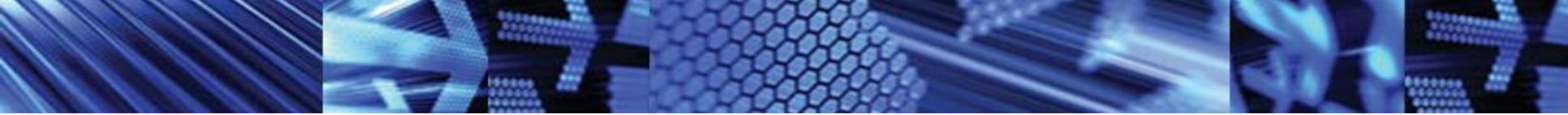


**Active Parking Management (APM):** A suite of strategies designed to affect the demand on parking capacity.

## Examples of ATDM Implementation Strategies

<b>ADM</b>	Comparative multi-modal travel times, dynamic ride-sharing, pricing, and incentive approaches.
<b>ATM</b>	Dynamic speed limits, dynamic shoulder use, queue warning, <b><u>adaptive ramp metering</u></b> .
<b>APM</b>	Parking pricing, real-time parking availability and reservation systems.

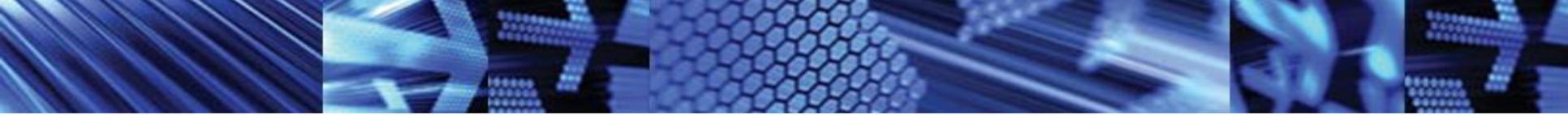




# FHWA's ATDM Program

- Increase awareness and understanding of ATDM.
- Train agencies to deploy effective ATDM systems.
- Research and investigate key ATDM challenges, gaps, and risks.
- Develop tools and guidance for practitioners.
- Evaluate and demonstrate the effectiveness of ATDM.





# Summary

- ATDM represents next evolutionary step in Transportation Systems Management & Operations (TSM&O).
- Based on real time and predicted information and dynamic actions.
- Performance driven.
- Demand management much more prominent than historical ITS and Operations.
- Several National program activities underway.





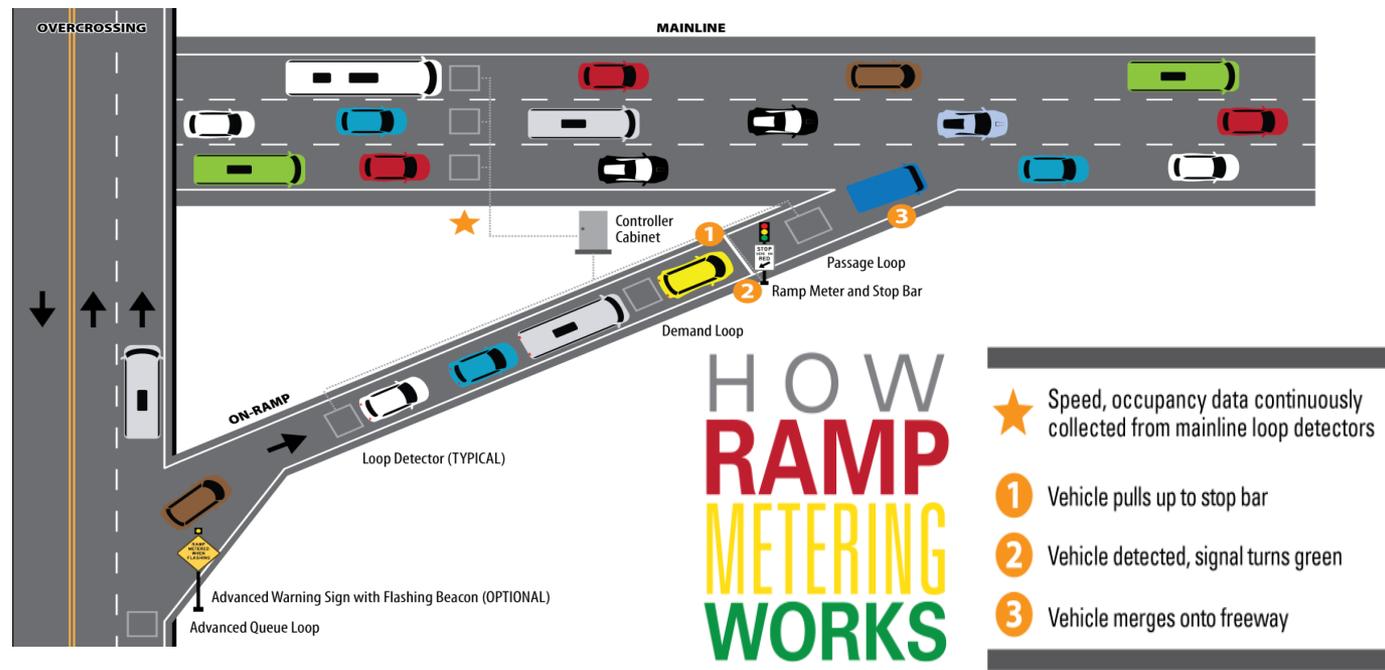
Les Jacobson

# OVERVIEW OF RAMP METERING



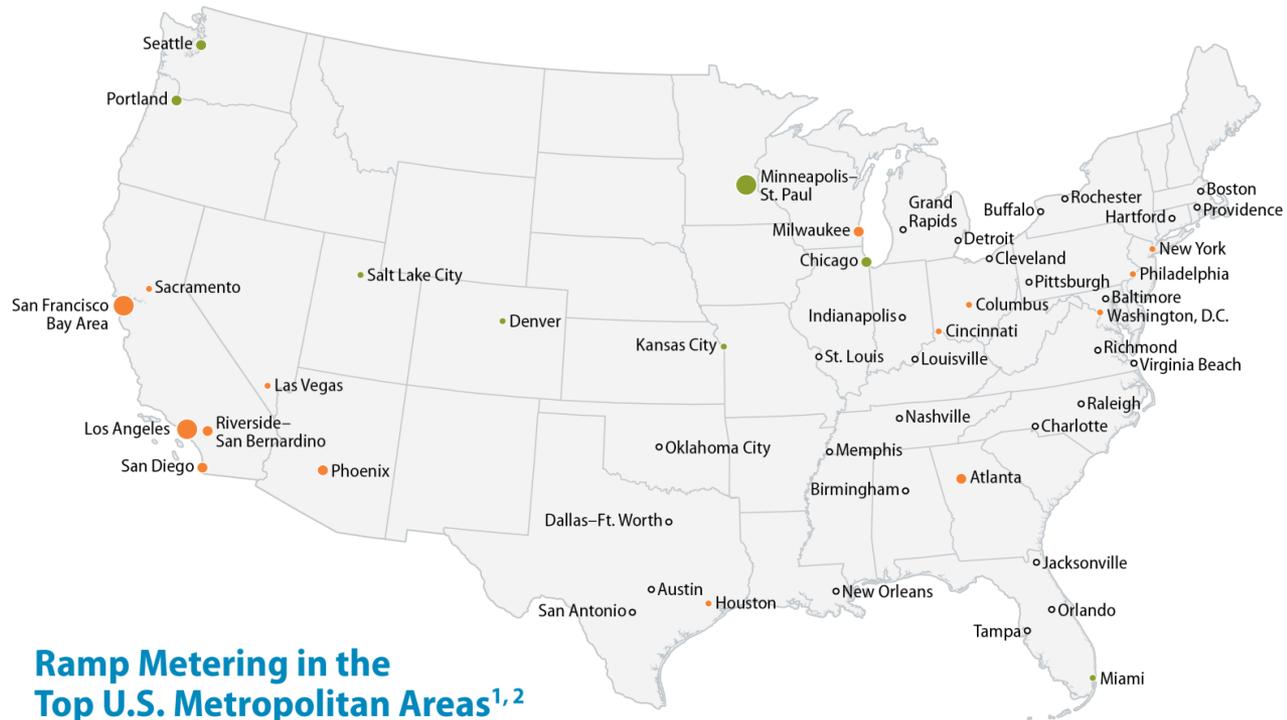
# Ramp Metering 101

- Reduces overall freeway congestion by managing the amount of traffic entering the freeway and by breaking up platoons
- Algorithm determines entrance rate based on mainline volume, speed, queue length



# Ramp Metering 101

- First deployed in the 1960's in Chicago, now in metro areas in the US, Europe, and Australia
- Varying degrees of scale, sophistication
- Many U.S. metro areas have not implemented ramp metering
- Many areas expanding ramp metering (68%)



#### Ramp Meter Penetration

- No ramp metering
- 1–100 ramp meters
- 101–300 ramp meters
- More than 300 ramp meters

#### Ramp Meter Control

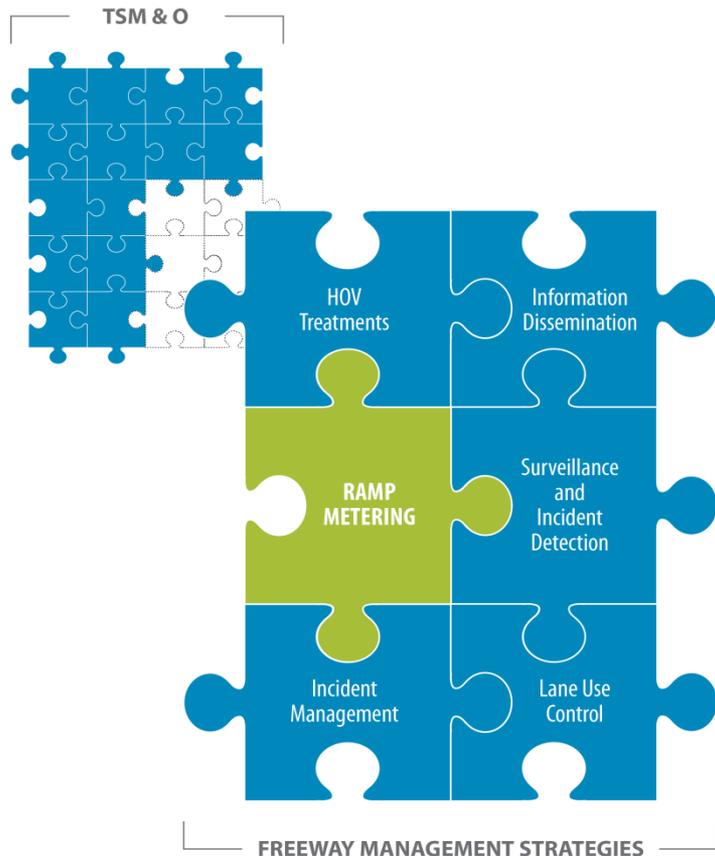
**Local or Fixed-Time Control:** Meters are either fixed/pre-timed to meet historical trends or are responsive/actuated to meet local, real-time conditions in the vicinity of the ramp.

**System Control:** Meters are responsive/actuated to system-wide conditions (i.e., optimizing flow along an entire facility, corridor, or system wide).

Note: 1. According to the 2010 United States Census, metro areas have a population greater than one million people.  
2. Ramp metering information is current as of 2014.



# Ramp Metering 101

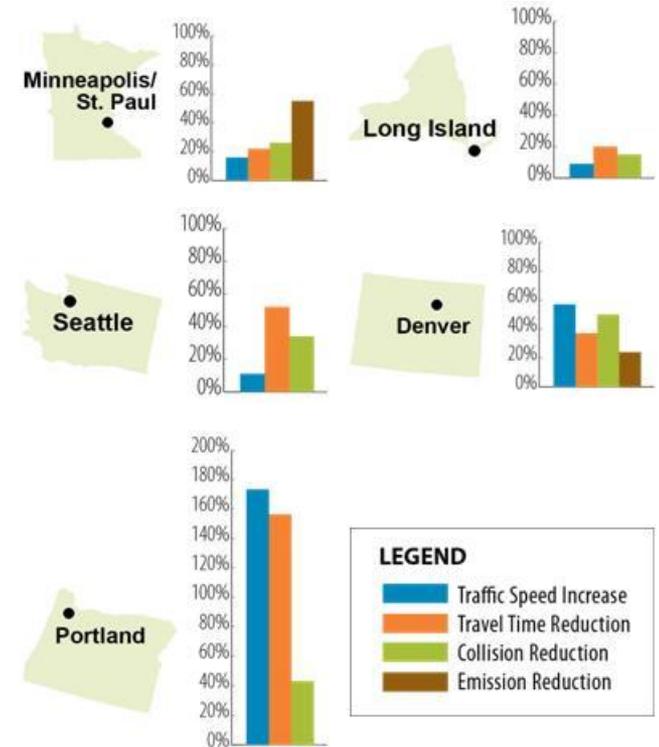


- Fits within other TSM&O programs
- Support/complement other programs
- Align goals/objectives (HOV, transit use, safety, etc.)
- 84% claimed as a “critical tool for managing system”



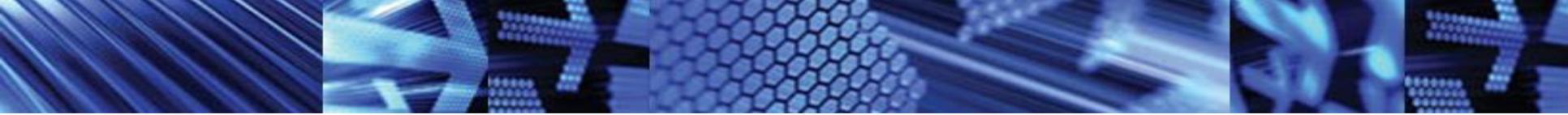
# Ramp Metering Benefits

- Mobility, Reliability, and Efficiency
  - Reduced travel times
  - Increased travel time reliability
  - Increased mainline speeds
- Safety
  - Crash reduction
- Reduced Environmental Impacts
  - Reduces stop-and-go conditions
  - Less fuel consumed
- High Benefit/Cost Ratio
  - Cost effectiveness
  - Twin Cities metering had B/C ratio of 15 : 1



Examples of actual measured benefits





# Ramp Metering Deployment Challenges

## Primary Challenges Currently Experienced by Agencies Deploying Ramp Metering:

- Existing Ramp Geometry (58%)
- Heavy Ramp Volume (25%)
- Costs and Funding (42%)
- Public Opposition (33%)
- Local Agency Opposition (17%)
- Lack of Agency Support (17%)



# Deployment Challenges: Existing Geometry and Heavy Ramp Volume

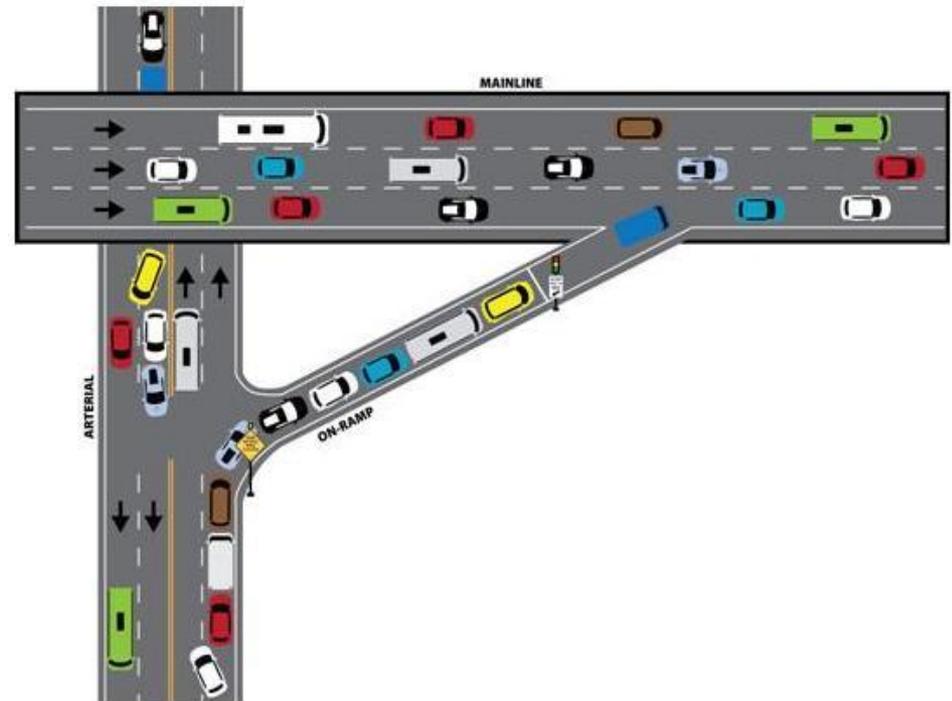
## ■ Geometric considerations for ramp metering suitability

- Acceleration length
- Mainline weaving
- Limited sight distances
- Experienced by 58% of agencies surveyed

## ■ Heavy Ramp Volume

- Queue length
- Arterial backup
- Ramp storage
- Experienced by 25% of agencies surveyed

Example of challenging geometry:

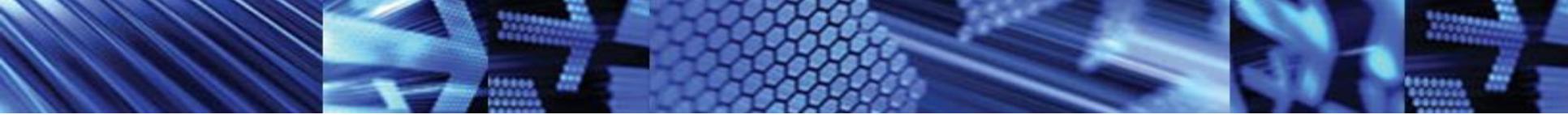


# Deployment Challenges (continued)



- **Costs & Funding**
  - Initial deployment, operations & maintenance
  - Priority of projects / competition for funding
  - Experienced by 42% of agencies surveyed
- **Public Opposition**
  - Misconceptions about ramp metering
  - Experienced by 33% of agencies surveyed
- **Local Agency Opposition**
  - Negative perceptions of ramp metering
  - Equity issues
  - Experienced by 17% of agencies surveyed
- **Lack of Agency Support**
  - Agency understanding
  - Sufficient staffing
  - Communication
  - Experienced by 17% of agencies surveyed





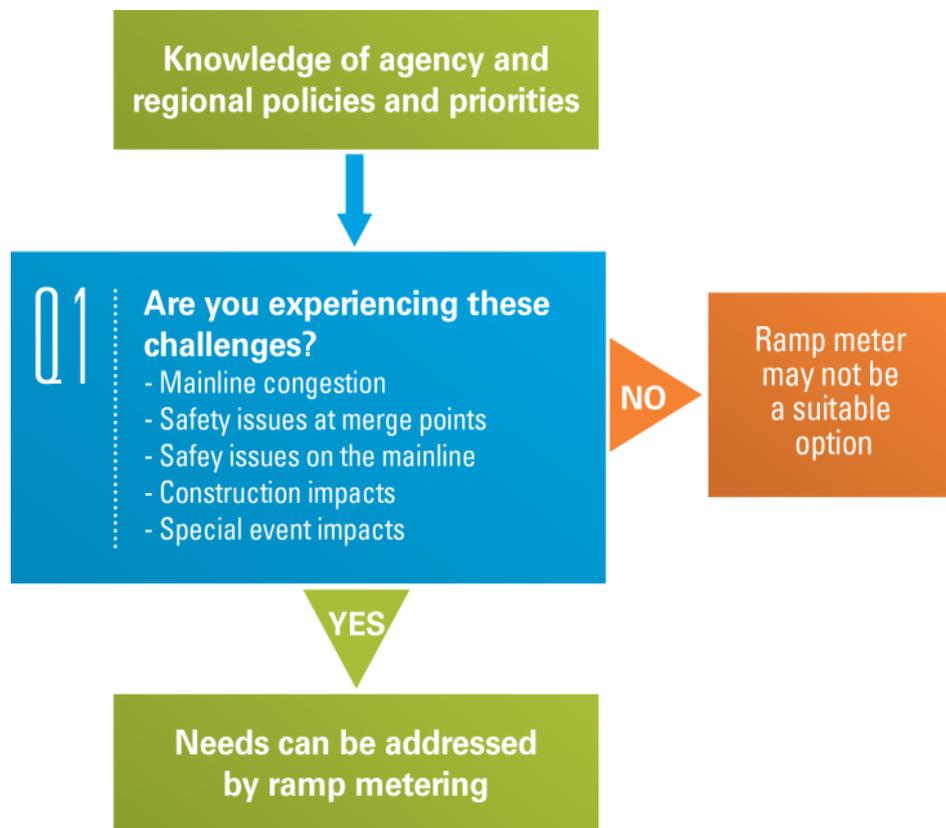
# Keys to Successful Ramp Metering Deployment/Expansion

- Suitability & Feasibility: Is Ramp Metering Right for You?
- Getting Ready for Ramp Metering
  - Gain Public & Agency Support
  - Identify Costs & Funding Sources
  - Understand Traffic Conditions
  - Consider Queue Lengths & Delays
- Operating Ramp Metering Effectively
  - Monitor Performance
  - Analyze Benefits and Costs
  - Monitor and Manage Ramp Queues



# Keys to Success: Feasibility & Suitability

- Agency must assess both the suitability and feasibility of ramp metering
- Consistency with regional/agency goals and priorities
- Operational challenges must be relevant to ramp metering

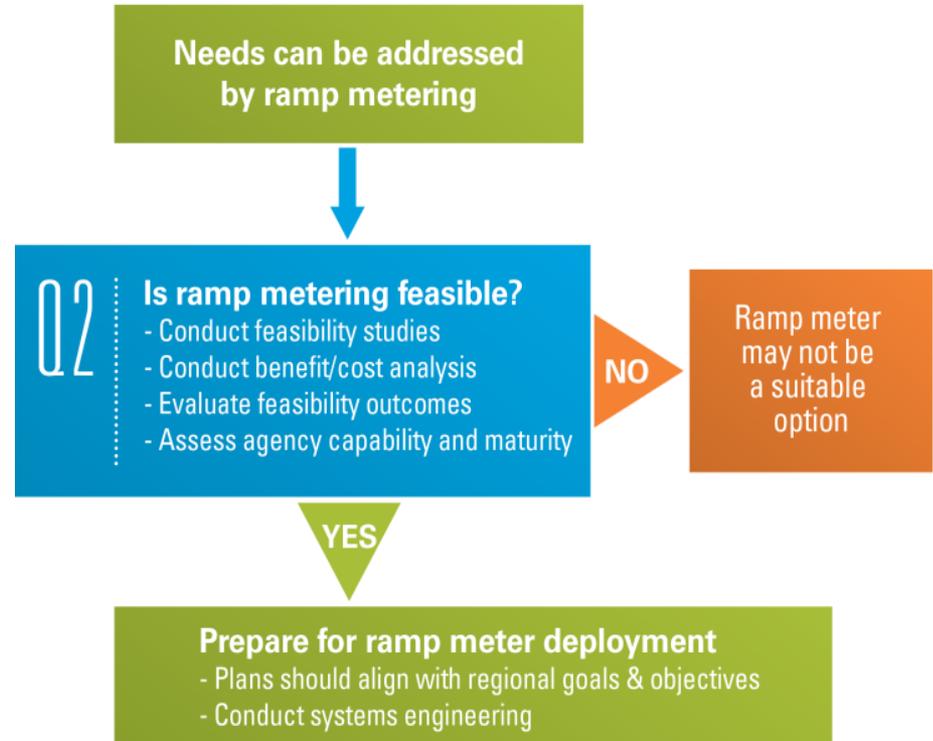


**Ramp metering deployment decision process flow**



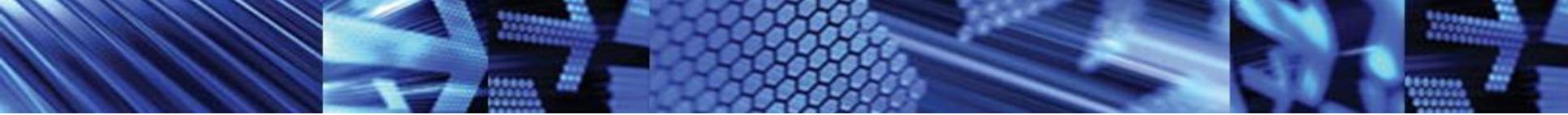
# Keys to Success: Feasibility & Suitability (cont.)

- Ramp metering feasibility
  - Feasibility studies
  - Benefit/cost analysis
  - Agency capability and maturity
- 58% of agencies said studies/evaluations helped overcome barriers to expansion



Ramp metering deployment decision process flow





# Keys to Success: Getting Ready for Ramp Metering

- Gain public and agency support
  - Familiarize the public
    - Provide easily accessible resources and materials (open houses, brochure, press releases, FAQ's on website, etc.)
    - Address misconceptions
    - Articulate the benefits
  - Inter-agency coordination and communication: early & often

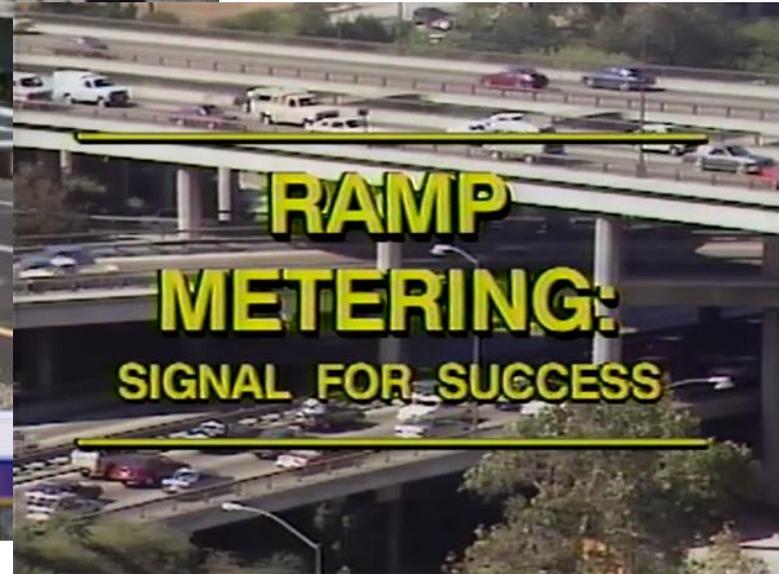


# Keys to Success: Public Outreach Examples



**Julie Infante**

▶ ODOT SIGNAL OPERATIONS ENGINEER



# Keys to Success: Public Outreach Examples (cont.)



Traffic & Cameras Projects Business Environment Maps

You are here: [Home](#) > [Traffic](#) > [Congestion](#) > [Ramp Meters](#)

## More Information

### Ramp Meters

[Contact Us](#)

### Traffic Links

[Seattle Area Traffic](#)

[Travel Alerts & Slowdowns](#)

[Statewide Traveler Info](#)

## Ramp Meters

### What are ramp meters?

Ramp meters are stop-and-go traffic signals that control the frequency with which vehicles enter the flow of traffic on a freeway.

### Why does WSDOT install ramp meters?

WSDOT uses ramp meters to reduce accidents and travel times for commuters. Most ramp meters allow one vehicle through each green light, creating a 4 to 15 second delay for cars entering the highway. This delay helps reduce freeway traffic and reduces accidents that occur when cars merge onto the highway.

### How do I use them?

Drive your vehicle up to the white line, or stop at the ramp meter. If the light is red, stop at the white line. If the light turns green, merge onto the freeway. If you are in an occupancy vehicle (HOV) bypass lane, buses, and trucks do not have to stop at the ramp meter signal. The delay of way over vehicles merging into traffic from the ramp.

### Where can I find ramp meters?

The majority of ramp meters are located on Interstate highways – I-5, SR 520, I-90, I-405 and I-95. Typically, ramps are metered from 6 a.m. to 7 p.m. These times may vary depending on the level of traffic congestion.

### Why are they effective?

Without ramp meters, multiple cars try to merge onto the freeway simultaneously. Drivers on the freeway slow down to allow the cars enter and these slower speeds quickly cause

## Ramp Signal Locations



**What you should know about Ramp Signaling**

**Qué usted debe saber sobre la Señalización de la Rampas**

**Tout sa ou ta dwe konnen de limyè wouj sou ramp yo (Ramp Signaling)**

ONE VEHICLE PER GREEN

TWO VEHICLES PER GREEN

www.95Express.com

- system-wide by at least 30%.
- On I-405 in Renton, ramp meters provided a travel times savings of 3 to 16 minutes.
- Ramp meters are a proven and cost-effective method of relieving traffic congestion.

## Ramp Signaling

Ramp signaling is a traffic control device that changes the color of the traffic signal from red to green. The signals are located along several entrance ramps to Interstate 95 (I-95) and help make merging onto the expressway easier and safer. Ramp meters are traffic control devices that change the color of the traffic signal from red to green lights. They control the rate at which vehicles enter the highway to ensure there are enough gaps available for each car to merge. The signals break up the groups of merging vehicles into smaller groups to reduce congestion and regulate the flow of traffic. They work based on real-time traffic information, and depending on the marked signal on the ramp, will allow one or two cars to merge onto the interstate per green light. Ramp meters are typically turned on during times of heavy freeway use, such as weekday rush-hour periods. Advanced warning signs will flash to warn drivers when Ramp Signals are turned on.

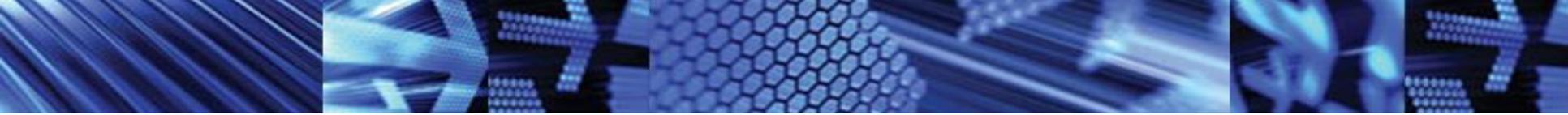
### Does Ramp Signaling Work?

When the signal is red: Pull up to the white line on the pavement before the "Stop Here on Red," sign to activate the ramp meter light. When the signal light turns green: One or two vehicles, as indicated by the signage on the ramp, should proceed and merge onto the interstate. Be patient. A short wait at the ramp will help reduce your travel times and improve your commute along the mainline.

The Ramp Signaling Program is part of an overall congestion-relief plan, which along with the 95 Express, is helping I-95 become a safer, more efficient road to travel in Miami-Dade County.

For more information about Ramp Signaling, please visit [www.95Express.com](http://www.95Express.com), or call 1-877-95X-FDOT (1-877-959-3368).

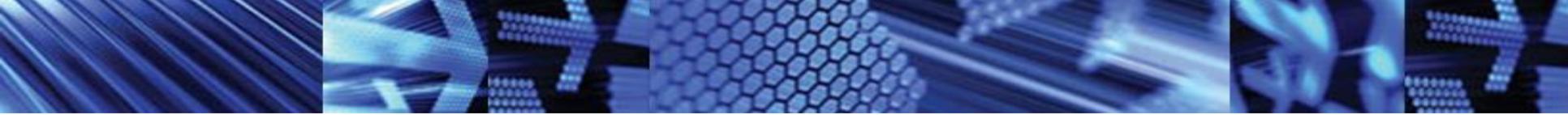




## Keys to Success: Getting Ready for Ramp Metering (cont.)

- Identify Costs and Funding Sources
  - Itemize the specific costs
  - Prioritize in budget/planning efforts
  - 42% of agencies without ramp meters said capital costs were a barrier to deployment
  - 25% of agencies without ramp meters said operations and maintenance costs were a barrier to deployment





# Keys to Success: Getting Ready for Ramp Metering (cont.)

- Understand Traffic Conditions
  - Volumes on ramps, mainline, and arterials
  - Impact of queue spillover onto arterials
  - 83% of agencies said general public found queue backup onto arterials to be an issue
- Consider Queue Lengths and Delays
  - Data collection, queue detection
  - Consider mainline and arterial traffic conditions
  - 78% of agencies said general public found queue wait to be an issue



# Keys to Success: Operating Effectively

- Monitor & Report Performance
  - Establish benchmarks
  - Measure several dimensions of performance
  - Identify areas of improvement
  - Report results to public, media
  - 42% used this to overcome barriers to ramp metering expansion



Dimensions of performance monitoring



# Keys to Success: Operating Effectively (cont.)

- Analyze Benefits and Costs
  - FHWA resources
    - Intelligent Transportation Systems (ITS) database
    - Tool for Operations Benefit/Cost (TOPS-BC)
    - Highway Capacity Manual, ATDM strategies section
  - Build case for ramp metering, use to reach out to stakeholders
- Monitor and Manage Ramp Queues
  - Can negatively affect public relations
  - Establish policies for queue wait times
  - Adjust algorithm parameters

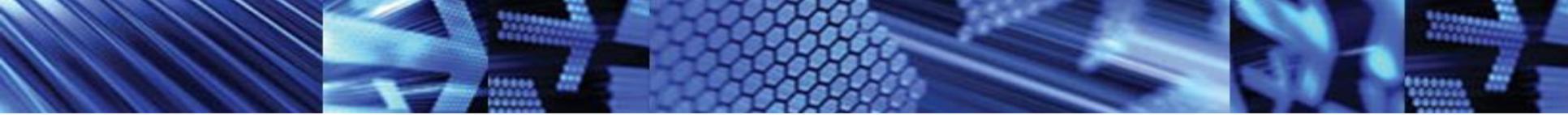


# Going Above and Beyond



- Special Treatments: HOV & Transit Bypass lanes (79% had configurations in addition to the standard 1-car-per-green)
- Adaptive Ramp Metering
- Arterial Signal Integration





Nick Thompson

# PRACTITIONER PANEL

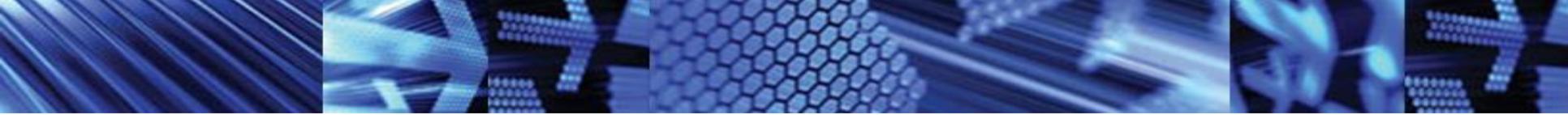




# Ramp Metering Practitioner Panel

- Mark Leth - *Washington State Department of Transportation*
- Brian Kary - *Minnesota Department of Transportation*
- Jason Sims - *Kansas City Scout*
- Javier Rodriguez - *Florida Department of Transportation*
- Meredith McDiarmid - *North Carolina Department of Transportation*





Mark Leth

# RAMP METERING IN THE SEATTLE AREA



# Beginning to Current

**TMC 1960'S**



**TMC (open 2015)**



## Initial Action

- First ramp meter activated in 1966
- Mitigation during initial Interstate 5 construction in north Seattle
- Removed after freeway constructed





# The Beginnings of a System

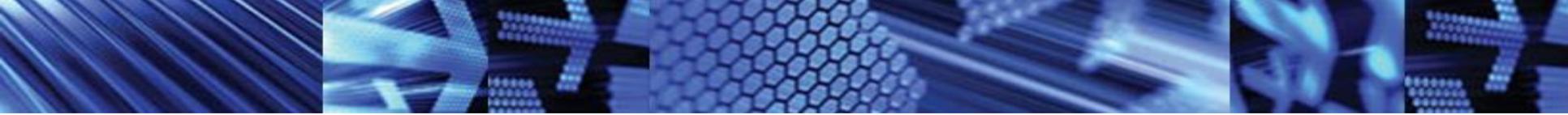
- Initial operation in 1981 of 22 ramp meters along I-5 north of Seattle Central Business District
- AM & PM peak periods
- Centralized control
- Significant mobility and collision reduction benefit



# Continued Expansion

- Currently operate 150 ramp meters on freeways within the Central Puget Sound area – close to 25 more coming soon
- Many added during past freeway HOV lane expansion
- In recent years, continued expansion & control system enhancement by the Traffic Operations program – metered shoulder lanes, etc.
- Fuzzy logic algorithm's, updates every 20 seconds, continued automation of features, etc.

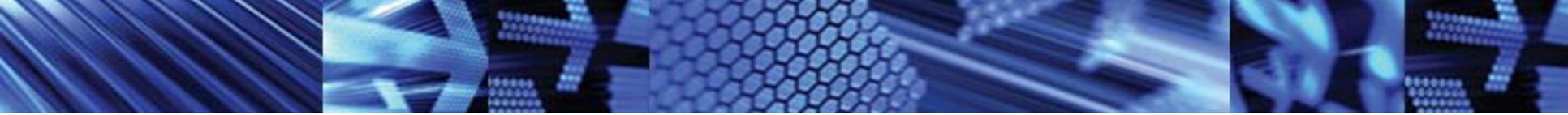




# Ramp Metering - Getting to “Yes” *(and sustaining)*

- Initial Planning
- What’s the Message?
- Influential Champion(s)
- Dialogue w/Local Agencies & Politicians
- Targeted Audience for Additional Outreach when necessary



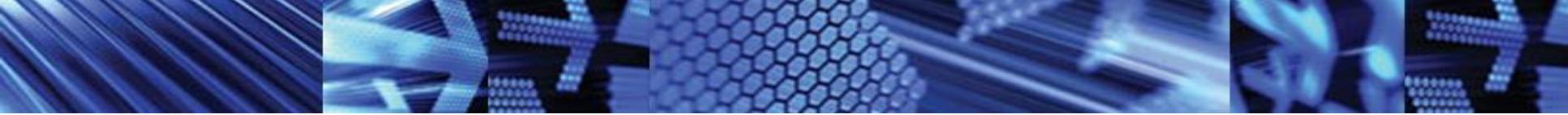


# Challenges Along the Way & How to Overcome Them

## ■ Agency Internal Support

- ITS, ramp metering, etc. has not been the core business of a state DOT
- Limited resources are moving DOT's more towards operational solutions – the opportunity is expanding
- Monitor, measure & report on outcomes; benefits vs. cost
- Professional, focused traffic operations organization
- Anticipate and mitigate operational problems quickly or in advance of potential impact (complaints!)





# Challenges Along the Way & How to Overcome Them (cont.)

## ■ Political opposition

- Data driven support on need and benefits, including benefit to the local population
- Disprove the myths & find common ground
  - Reduce cut through traffic through neighborhoods
  - Agreement on ongoing performance measurement, quick response to local concerns, etc.
- Avoid agreements that limit flexibility (such as hours of operation). Active Traffic Management is most effective when system operations can immediately respond to emergent conditions.





# Challenges Along the Way & How to Overcome Them (cont.)

- Retaining an Integrated O&M Workforce
  - ITS Design & Operations
  - TMC Operations
  - Software Development & Support
  - ITS Maintenance
  - Sustainable, flexible funding source



# Mitigating Ongoing Challenges

## Field Actions

### Continued pursuit of practical, supported & fundable solutions

- Dynamic ramp metering lane designation
  - HOV 2+ bypass OR HOV 3+ bypass
  - HOV to HOV OR Freight bypass
  - HOV bypass OR General Purpose bypass
- Increased use of metered shoulder lanes on ramps



# Mitigating Ongoing Challenges

## Field Actions

- Restripe of existing ramps, with or without minor widening of the ramp and/or connecting arterial
- Implementation of “form two lines when metered” operations that is in place elsewhere in the country

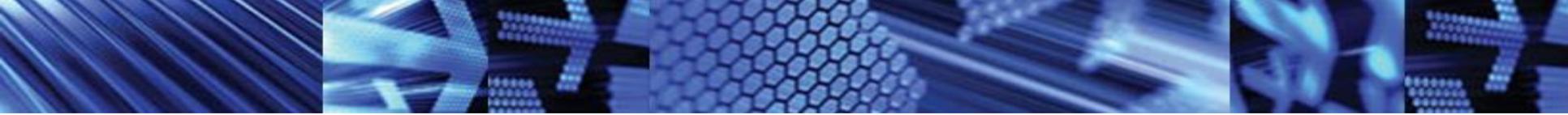


# Questions?

Mark Leth, P.E.

206.440.4487

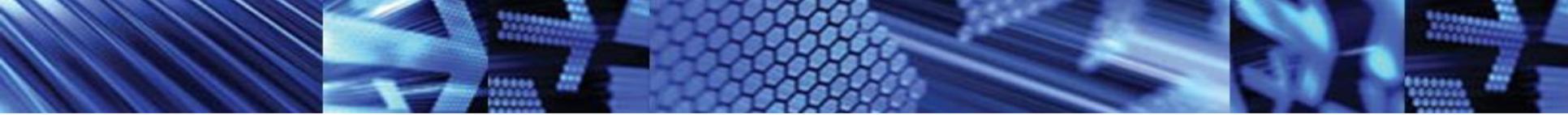
[lethm@wsdot.wa.gov](mailto:lethm@wsdot.wa.gov)



Brian Kary

# RAMP METERING IN MINNESOTA





# RAMP METERING IN MINNESOTA

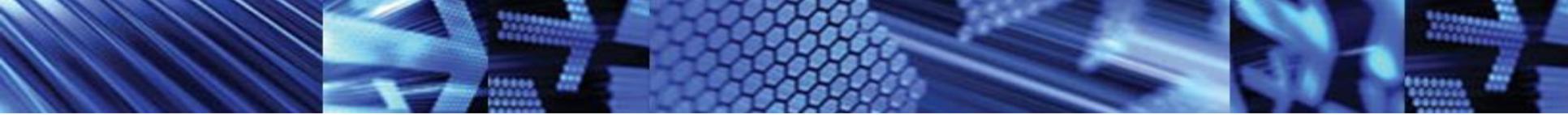
BRIAN KARY  
FREEWAY OPERATIONS ENGINEER



# MnDOT Ramp Meters

- 1969 – First MN ramp meters tested on I-35E in St. Paul
- Today – The system includes over 420 ramp meters.
- Metering rates adjust every 30 seconds based on real-time traffic conditions



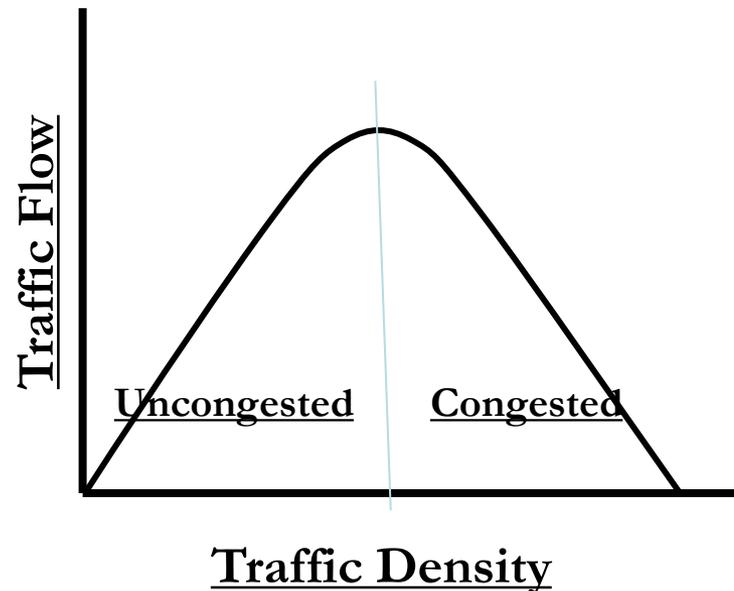


# How do Ramp Meters Operate in Minnesota?

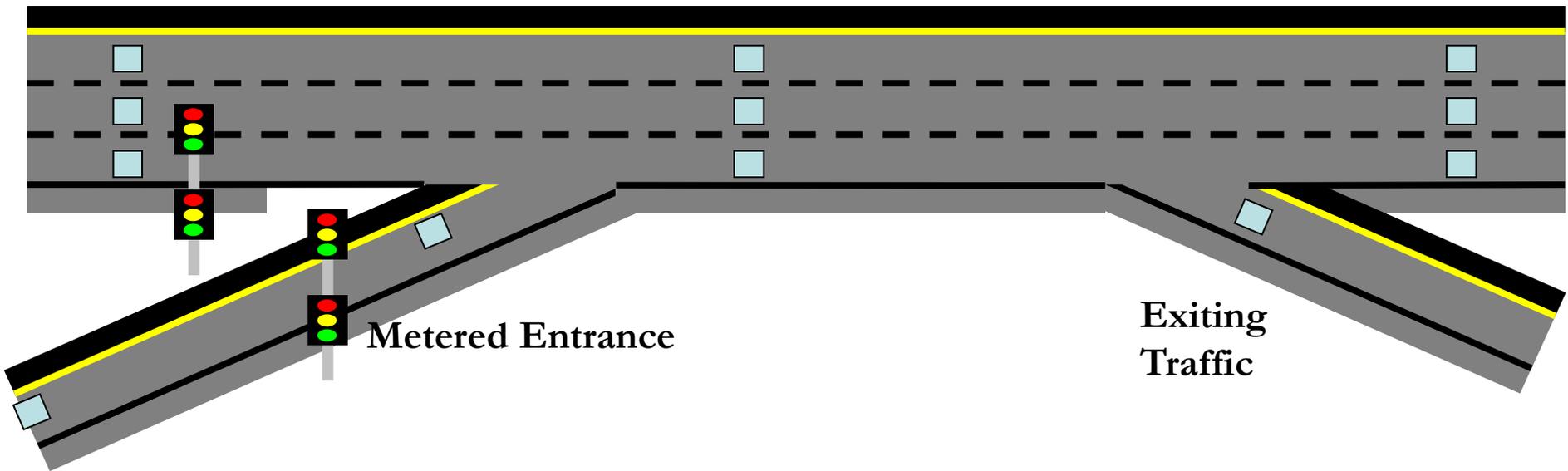


# Minnesota Ramp Control Algorithms

- ZONE algorithm – 1990s
- Stratified Zone Metering (SZM) – 2000s
- Density Based Algorithm - 2014

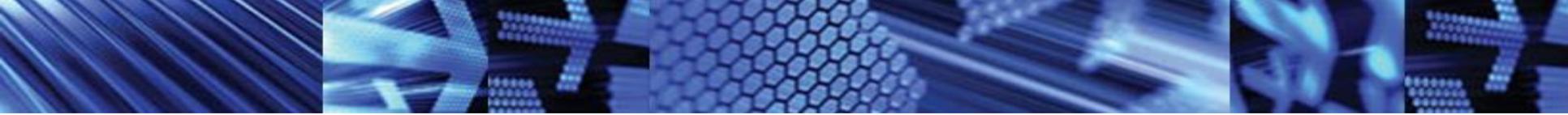


# Ramp Meter Zone



- System measures highest density up to 3 miles downstream
- Metering rates adjust every 30 seconds based on mainline conditions and ramp demand
- Queue detector measures demand and prevents backup onto cross street





# Ramp Meter Challenges

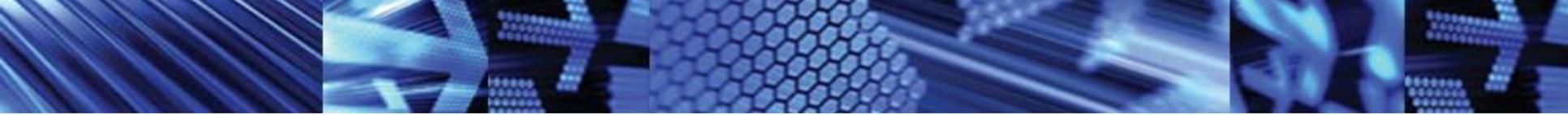




# Why are Ramp Meters Controversial?

- The results are counter-intuitive
  - The public is less tolerable of waiting when meters are working correctly
- The safety benefits are not perceived by the motorists
  - Saving 6 crashes a day does not sound like a lot
- People do not like to wait in line

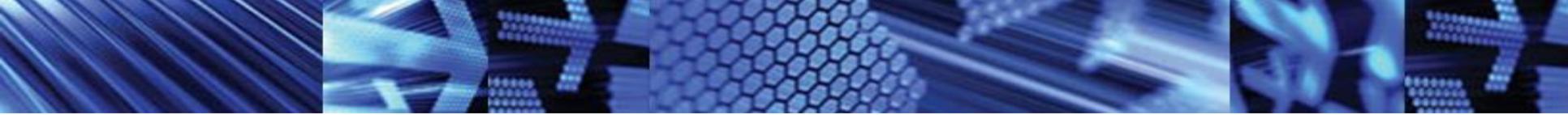




# Ramp Meter Shutdown Study

- Legislatively mandated study in 2000
- Turned off the meters for 5-weeks in Sept 2000
- Results of the study found:
  - Improved Throughput by 10%
  - Improved Freeway Travel Times by 20%
  - Improved Travel Time Reliability by 90%
  - Reduced Crashes by 25%
  - Reduced Congestion resulting in Reduced Emissions and Fuel Consumption

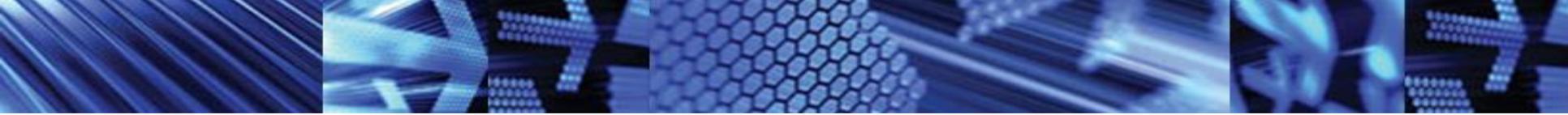




# Benefit/Cost Analysis

- Annual savings of approximately \$40 Million to the Twin Cities Traveling Public
- Annual cost of \$2.6 Million to operate ramp meters
- 15.1:1 Benefit/Cost Ratio for Ramp Metering

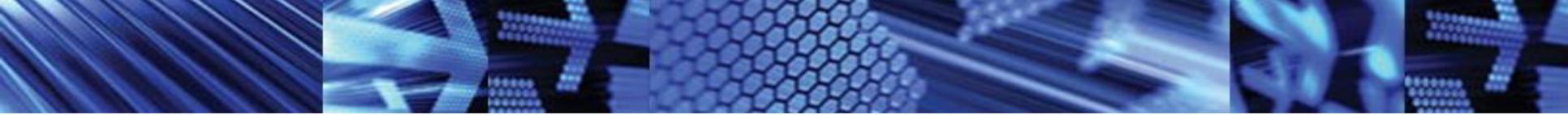




# Mn/DOT Policy

- Ramp meter waits
  - no more than four minutes per vehicle on local ramps
  - two minutes per vehicle on freeway-to-freeway ramps.
- Vehicles waiting at meters will not back up onto adjacent roadways
- Meter operation will respond to congestion and operate only when needed.
- Limited Hours of Operations
  - AM Peak – 5:30 AM to 9:00 AM
  - PM Peak – 2:00 PM to 6:30 PM





Jason Sims

# KANSAS CITY SCOUT



# Accelerating Ramp Metering Deployment

December 10<sup>th</sup>, 2014

E. Jason Sims P.E.  
Traffic Center Manager Kansas City Scout





# Partners



# Project Map



✘ Ramp Meter Location



# KC Scout Ramp Metering Corridor Adaptive Approach

Viewer | RMC M435EBCA-04 2010/01/19 12:01

Location: I-435 E Postmile 18.82 at Wornall Active Requested

Number of Lanes: 2 Command Source: Interconnect Interconnect

Status: Dark Action: Dark

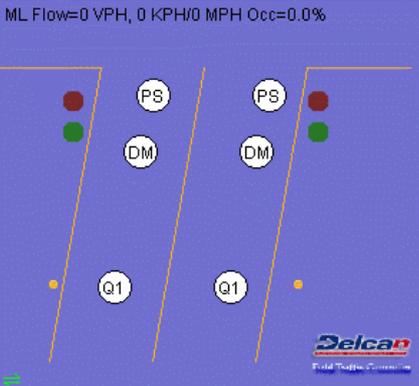
Schedule Entry: 0 Metering Rate (vphpl)

Day Plan: 0, Event 0 Vehicles Per Green: 1

Alarms

Load Applet Unload Applet

ML Flow=0 VPH, 0 KPH/0 MPH Occ=0.0%



	Ramp 1	Ramp 2
Source	IC	IC
Action	Dark	Dark
B-Rate	0	0
I-Rate	0	0
Plan	1	1
WFO	1	1
A-Rate	0	0
DNDST	Working	Working
F_STAT	Working	Working
F_CNT	2	0
F_VID	0	0
Interval	INITIAL	INITIAL
QUE1ST	Disable	Disable
QUE1FG	NORMAL	NORMAL
QUE1ST	Working	Working
QUE1FG	NORMAL	NORMAL

FTC Administration Web Page

Select a Device

Central Mainline Parameters Strategies Scheduler Plans CARMA

Operational Mode Control

Disable

Local

Enable Central Algorithm

Direct Control

Meter at 600 vphpl. for 15 minutes Send

Turn meter dark for 15 minutes Send

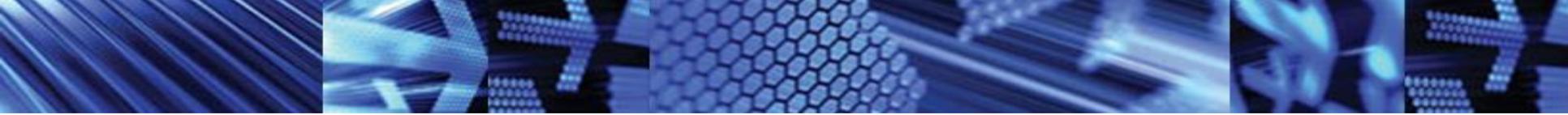
Send Emergency Green for 15 minutes Send

Query Plan Data From Controller

Refresh Plan Data

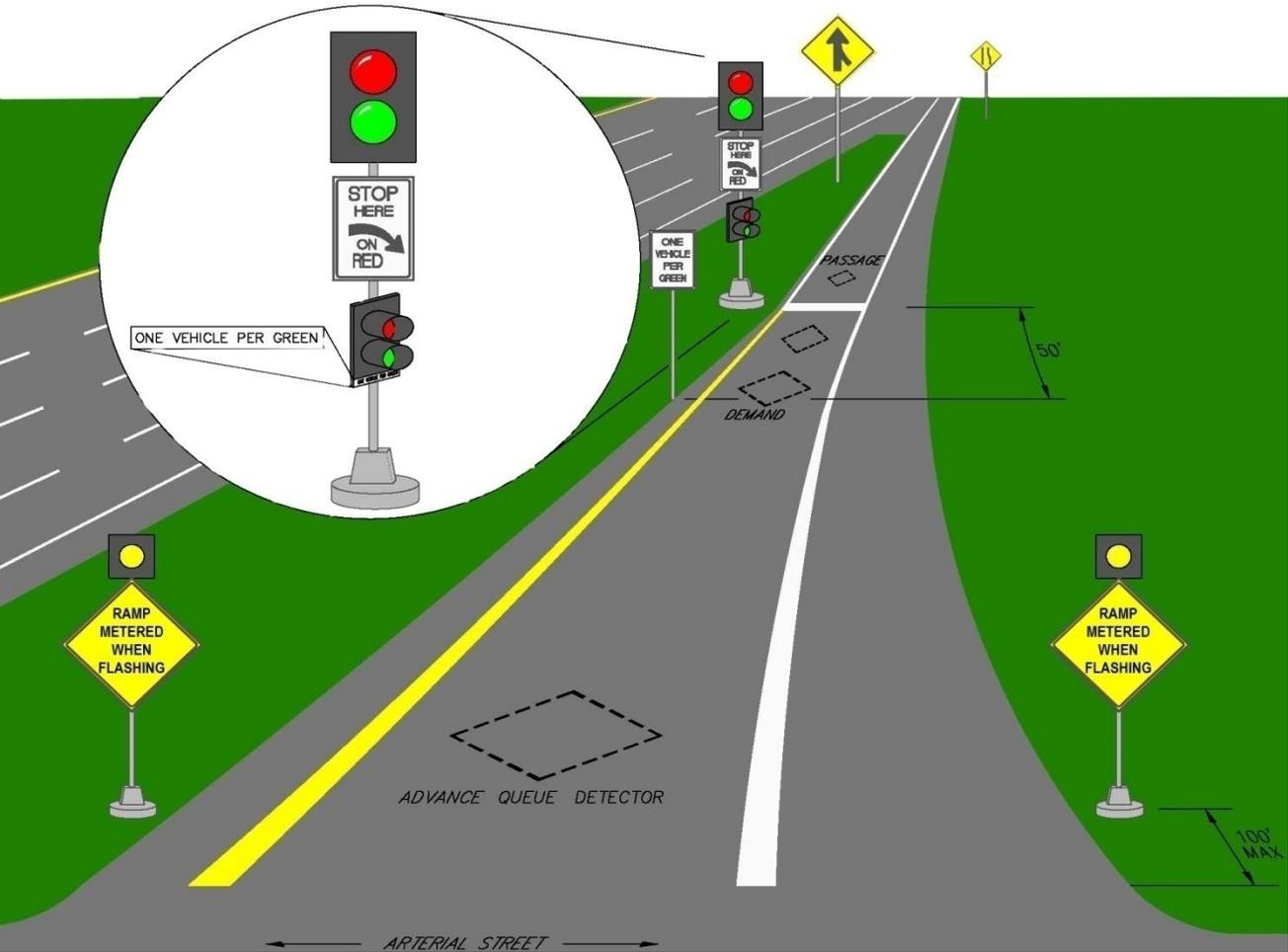
DMS CCTV Events Ramps HAR Weather VDS AVL Gates





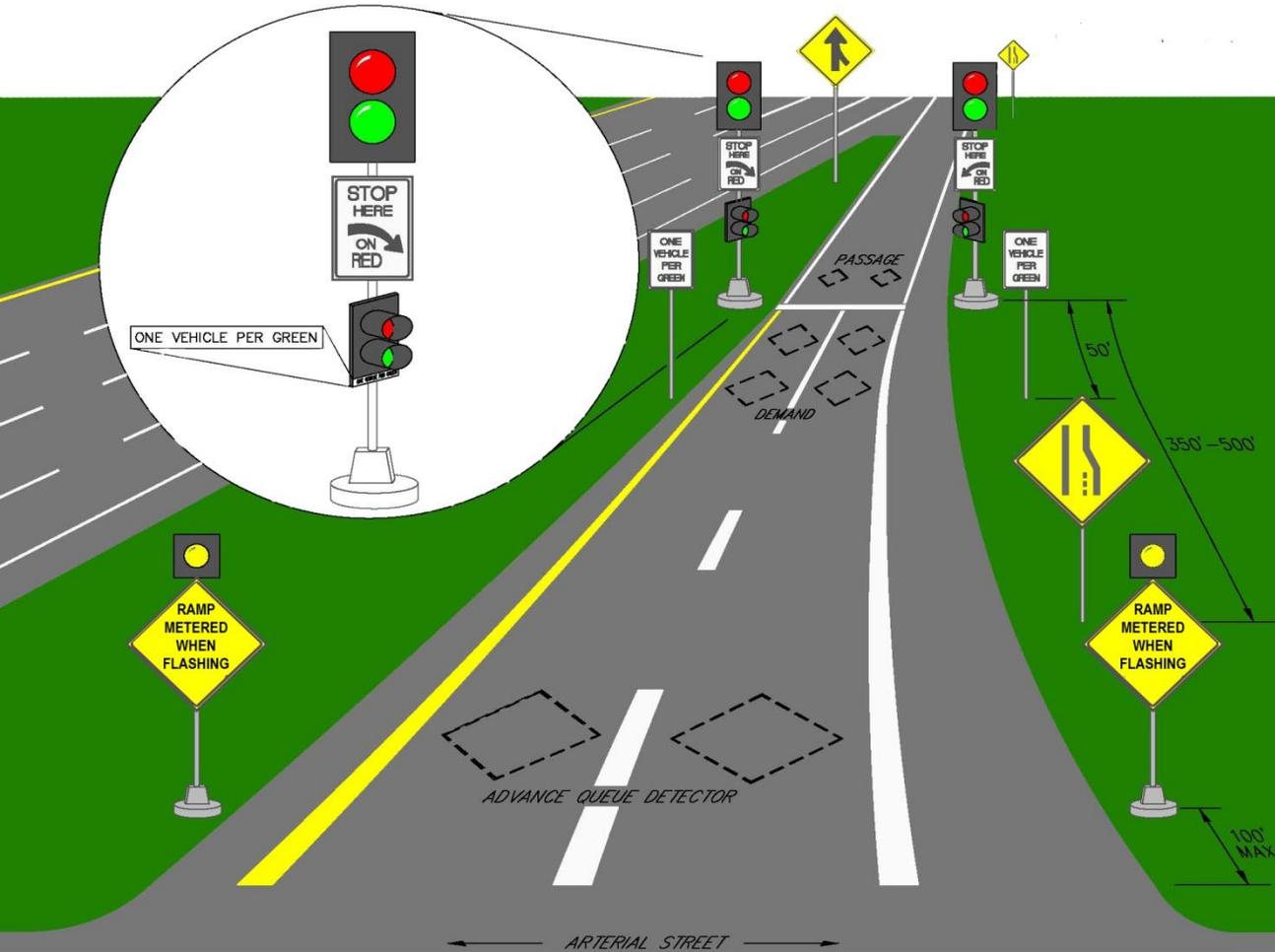
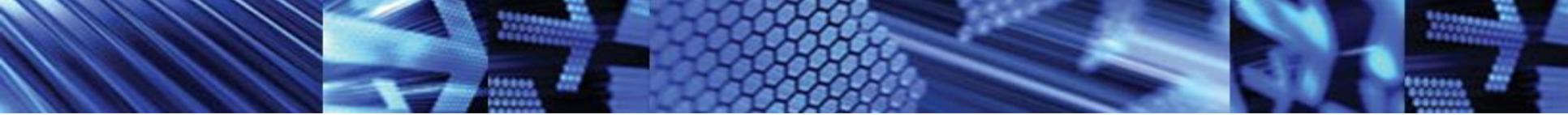
# Look and Feel of Kansas City Ramp Meters





## One-Lane Ramp, One Vehicle Per Green





## Two-Lane Ramp, One Vehicle Per Green



Kansas City

MoDOT + KDOT

**SCOUT**

# Public Relations Challenges



# Campaign Objectives

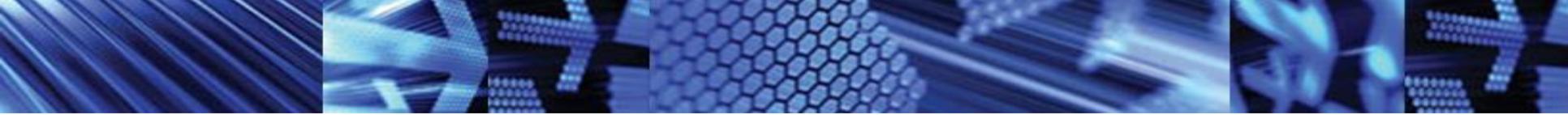
- Maximize communication
- Build on existing partnerships
- Create new relationships



# Reach Targeted Audiences

Audience	Thematic Outreach Materials
Technical staff and local officials	Technical content with emphasis on facts, benefits, and experiences of other communities
Local public officials	Less technical content with accent on ramp metering benefits and safety
Law enforcement (highway patrol)	Focuses on ramp metering operation and enforcement
General public	Highly graphic, non-technical, and focuses on the need for ramp metering





# Measuring Performance



# THE KANSAS CITY SCOUT

Kansas City Scout is Kansas City's bistate traffic management system. It is a result of partnership between the Kansas Department of Transportation (KDOT), Missouri Department of Transportation (MoDOT), Mid-America Regional Council, and the Federal Highway Administration (FHWA). These partners designed the system to lessen traffic jams by improving rush-hour speeds, to improve safety by decreasing the number of rush-hour crashes, and to improve emergency response to traffic situations.

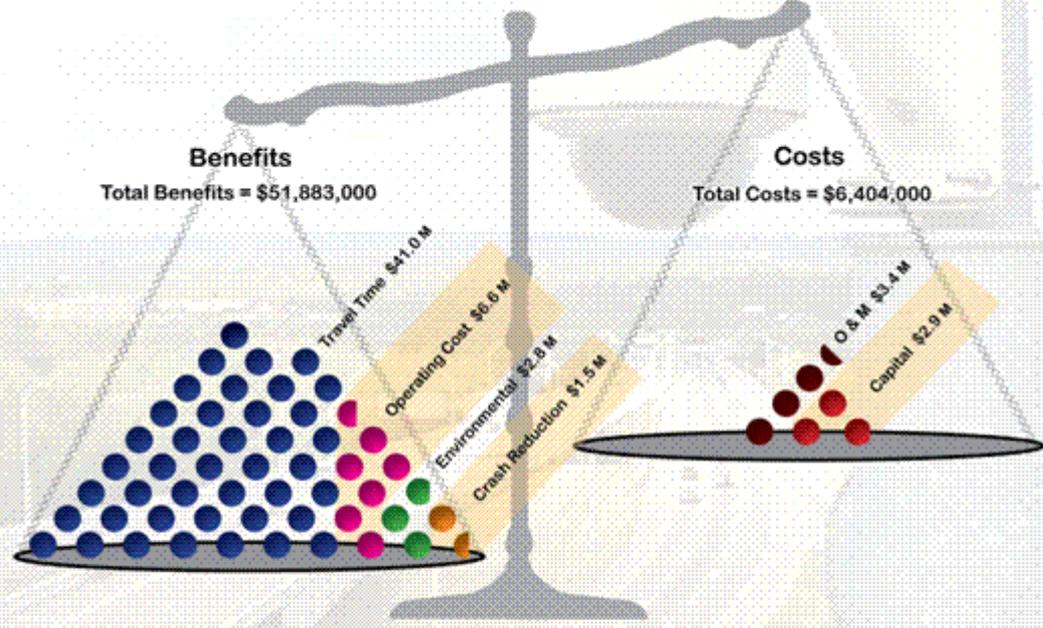
## THE IMPACT OF THE KC SCOUT

As Kansas City's driving population grows, traffic issues such as congestion, crashes, and air pollution become even more acute. Inadequate funding and, in some cases, inadequate infrastructure to widen roadways have made new construction and maintenance an increasingly difficult solution. Still, the need for a more efficient system for freeway travelers continues. In the past, states, technology and traffic management have been the answer to these problems. For Kansas City, the answer is the Scout.

Launched in 2004, Scout manages traffic on more than 100 miles of continuous freeways in the greater Kansas City metro area. Scout uses cameras to monitor the highways from its management center in Lee's Summit. The system relies on sensors to gauge traffic flow and to generate real-time accurate traffic data, and uses large electronic message boards to send traffic notices to drivers along the freeways. Scout also uses the Highway Advisory Radio system on 1690 AM that motorists in Missouri can tune to in the event of a freeway incident. The bistate incident management program uses Motorist Assist Emergency Response patrols to help clear roadways, reduce congestion, and aid injured or stranded travelers. Additional congestion management tools include a pilot corridor congestion metering and the interstate to arterial program partnership with MARC's Operation GreenLight (marc.org). There also is a recent redesign of the interactive web site (kcsout.net), "My KC Scout" personalized web alerts, regional video distribution, and jam cell cams.

## Summary of Kansas City SCOUT Annual Program Benefits vs. Costs

**Benefit to Cost Ratio = 8.1** → For every \$1 spent on the KC SCOUT program, transportation system users and system management agencies see approximately \$8 in benefits.



**KEY**  
Each circle represents \$1M in value.

<b>Benefits</b>			
<b>Travel Time</b>	Time saved by drivers due to reduced congestion	<b>Operating Cost</b>	Fuel savings
<b>Crash Reduction</b>	Elevated safety levels reduce secondary crashes	<b>Environmental</b>	Reductions in carbon emissions
<b>Costs</b>			
<b>Annual O &amp; M</b>	Costs to operate and maintain	<b>Annualized Capital</b>	Includes initial capital investment and replacement costs

KANSAS CITY SCOUT  
TRAFFIC MANAGEMENT  
SYSTEM

...in ben-  
...ncies. These  
...gs in fuel and other  
...ge Signs are essential in  
...he information that is dissemi-  
...nagement has become a regional  
...tion of incidents lasting over 90 minutes,  
...e. Motorist Assist plays a key role in the suc-  
...ctively, these three major components of the KC  
...costs to build and maintain the program.

## Program Benefits vs. Costs

...gram, transportation system users  
...approximately \$8 in benefits.



<b>Annual O &amp; M</b>	Costs to operate and maintain	<b>Annualized Capital</b>	Includes initial capital investment and replacement costs
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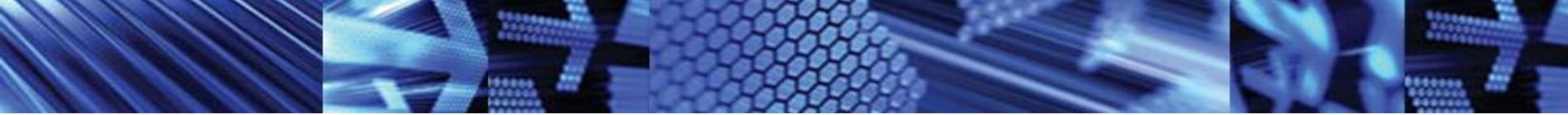
# Ramp Metering Website and Performance Measure Reports

[www.kcscout.net](http://www.kcscout.net)



Scout App featuring “Real Time  
Performance Measures”





Javier Rodriguez

# RAMP METERING ON INTERSTATE 95 – THE MIAMI EXPERIENCE

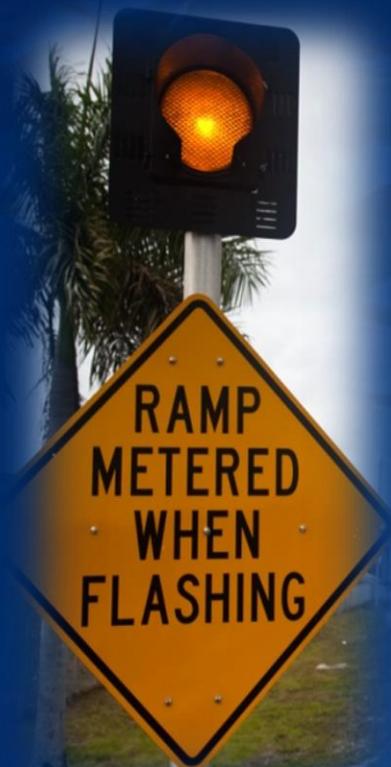




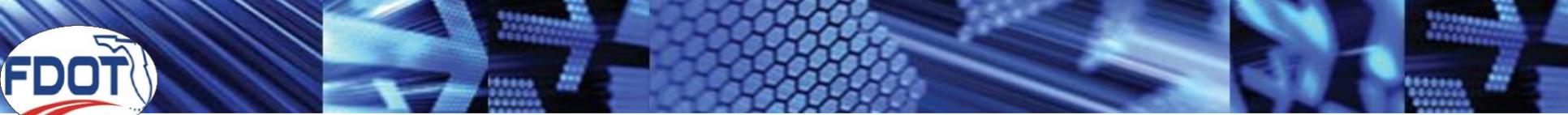
**SUNGUIDE TRANSPORTATION MANAGEMENT CENTER**  
FLORIDA DEPARTMENT OF TRANSPORTATION - DISTRICT 6



# Ramp Metering on Interstate 95 – The Miami Experience



Federal Highway Administration – Ramp Metering Webinar  
December 10, 2014  
Javier Rodriguez, P.E., District Six ITS Operations Engineer



# Ramp Meters in Miami

## □ First Ramp Metering System in Florida

- Managed by D6 SunGuide Transportation Management Center

## □ Phase 1A

- Launch Date: February 4, 2009
- 8 Signals; NB from NW 62 St to the Golden Glades Interchange (GGI) on I-95

## □ Phase 1B

- Launch Date: April 14, 2010
- 12 Signals; SB from Ives Dairy Rd to NW 62 St on I-95
- 2 Signals; NB from the GGI to Ives Dairy Rd on I-95





# Challenges

## 1. First in Florida

- **New Traffic Concept to South Florida, FDOT & Drivers**

## 2. Initial Launch Vs. Official Launch

- **2005 Vs. 2009 – Four Year Gap!**

## 3. System Readiness

- **Integration with New Ramp Metering Software**

1. Software and Hardware Testing, Software Configuration

- **Solutions**

1. Industry Experts Added to Team
2. Dedicated Team Focused on Deployment
3. Developed Procedures to Test & Configure Equipment & Software





# Challenges

## 4. Staffing and Operational Needs

1. Lack of Local Experience
2. Transitioning Roles of TMC & Existing Staff
3. Lack of Monitoring Ability

### □ Solutions

1. Added Industry Experts to the Team
2. Modified Contract to Support TMC Transition
3. Added CCTVs to Monitor Operations





# Challenges

## 5. Agency Education & Coordination

- Internal/External**

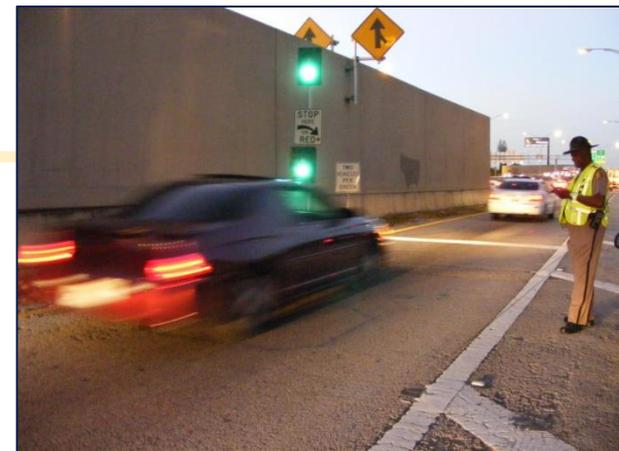
1. Multiple On-Going Highway Projects

- Training**

- Enforcement**

- Solution**

1. Developed Specialized Trainings & Project Workshops w/ Stakeholders
2. Modified FHP Hire-Back Contract to Support Enforcement





# Challenges

## 6. Public Acceptance

- Public Skepticism**
- Driver Adherence**

1. Driver Behavior = Project Success

- Solution**

1. Added Ramp Metering to 95 Express PI Effort to Maximize Benefit
2. Tri-Lingual Public Awareness Efforts & Material
3. Feedback from Field Observers & PIO Used to Ease Driver Adjustment





# "Buckle Up America. Every Trip. Every Time."

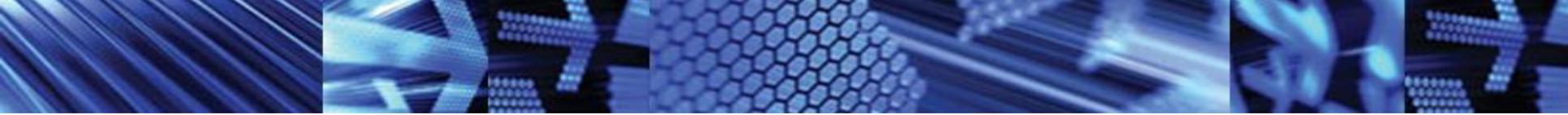
For more information please contact:

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(305) 640-7307

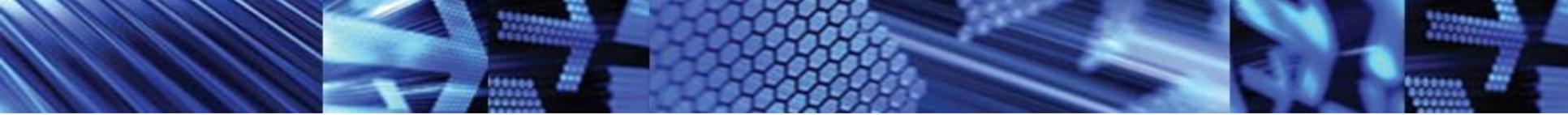




Meredith McDiarmid

# RALEIGH AREA RAMP METERING FEASIBILITY STUDY





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# North Carolina

DEPARTMENT OF TRANSPORTATION

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## Ramp Metering Feasibility Study

Meredith McDiarmid, PE

December 10, 2014



# Feasibility Study Elements

- Data Collection
- National Research
- Legal and Legislative Review
- Screening and Detailed Analysis
- Plan for Marketing and Outreach





# High Level Feasibility Study Findings

- Ramp meters can work in NC too!
- Minor legislative change to explicitly allow motorists to proceed past a “dark” ramp metering signal without stopping first
- Minor revision to penalty for proceeding through a red ramp metering signal
- Marketing and Public Outreach will be key to the success of the first ramp meter in NC

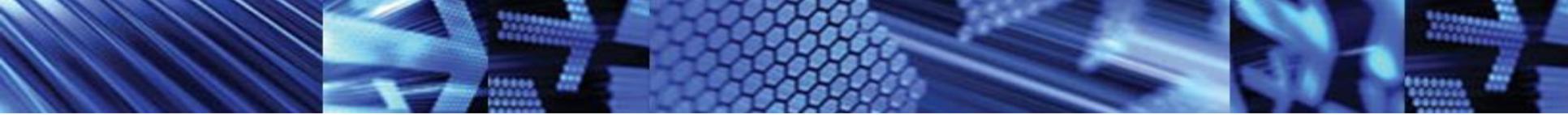
## 4.1. Ramp Meter Performance Data

The following tables summarize some of the available ramp meter performance data from existing ramp meter deployments.

Table 5. Summary of Ramp Metering Performance Improvements

Performance Measure	Location and Result
Travel time	Atlanta – 10% decrease in peak period Houston – 22% decrease in peak period Arlington – 10% decrease in peak period
Travel speed	Milwaukee – 35% increase in peak period Portland – 155% increase in peak period Detroit – 8% increase Los Angeles – 15 mph increase
Crash rate	Phoenix – 16% decrease during metered hours Milwaukee – 15% decrease in peak period
Crash frequency	Portland – 43% decrease Sacramento – 50% decrease Los Angeles – 20% decrease
Driver hours saved	Sacramento – 50% decrease Los Angeles – 8,470 hours per day
Vehicle volume	Milwaukee – 22% increase in peak period Sacramento – 5% increase in peak period Detroit – 14% increase in volume Los Angeles – increase of 900 vehicles per day
Gallons of fuel saved	Portland – 700 gallons per weekday
Emissions reduction	Minneapolis – reduction of 1,160 tons annually
Benefit-Cost ratio	Atlanta – about 4:1 in year 1, about 20:1 after 5 years

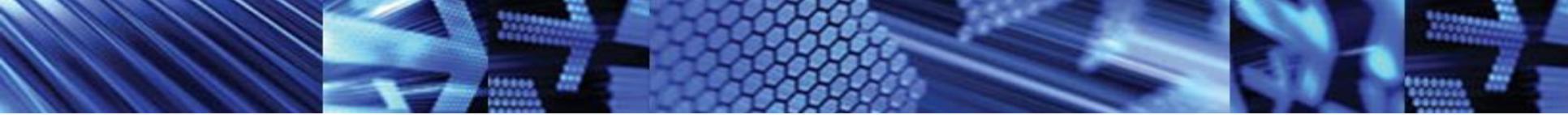




# Low Level Feasibility Study Findings

- Benefit Cost Ratios are the best way to prioritize potential ramp metering sites
- In some cases, multiple ramp meters work together to address congestion
- Implementation approaches can make or break a ramp metering program
- Marketing and Public Outreach will take longer than implementation





# Ramp Meter Implementation

- Performed a deeper dive into an area local engineers believed had potential for successful first implementation
- Intentionally did not pick the highest B/C site to implement first
- First ramp meter implementation anticipated to begin late 2017 and operational 2018



# Implementation Area

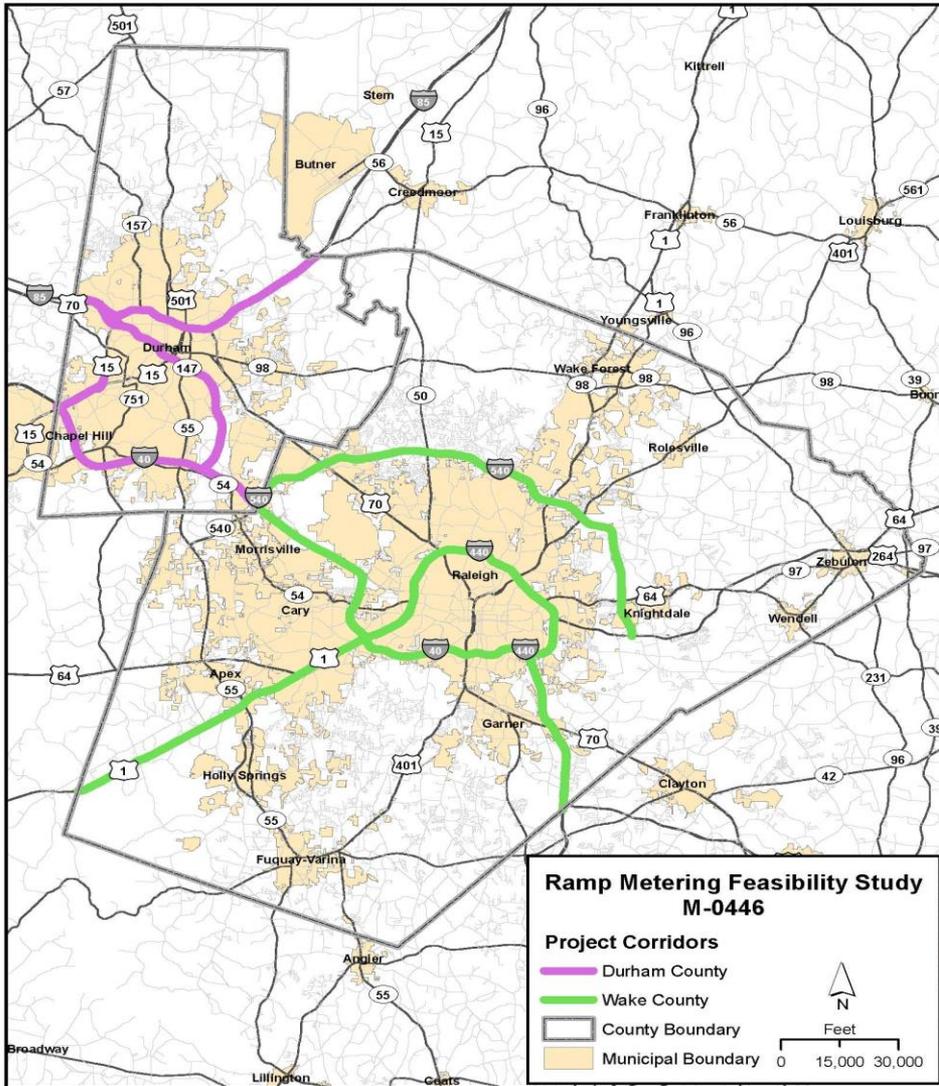
Wake County

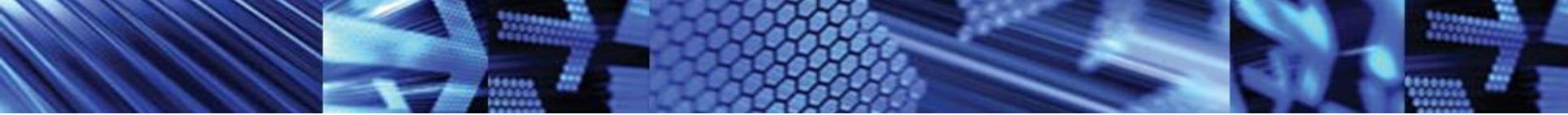
I-540

4 Ramp Meters westbound

2018

\$900K





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# North Carolina

DEPARTMENT OF TRANSPORTATION

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## Ramp Metering Feasibility Study

<http://www.campo-nc.us/ramp-metering.html>

### **PARTNERING**

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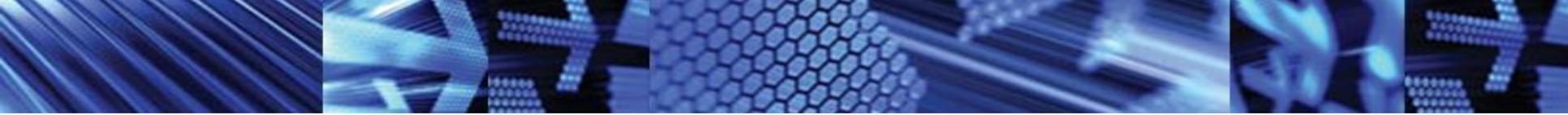
### **DESIGN**

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### **IMPLEMENTATION**

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# OPEN DISCUSSION



# Question and Answer Session



# Points of Contact



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# Knowledge and Technology Transfer

- Lessons Learned
- Engagement with professional associations

■ Website <http://ops.fhwa.dot.gov/atdm/about/program.htm>

U.S. Department of Transportation  
Federal Highway Administration

FHWA Home | Feedback

ACTIVE TRANSPORTATION AND DEMAND MANAGEMENT

OFFICE OF OPERATIONS 21<sup>ST</sup> CENTURY OPERATIONS USING 21<sup>ST</sup> CENTURY TECHNOLOGIES

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## Welcome to Active Transportation and Demand Management

The Active Transportation and Demand Management (ATDM) program is intended to support agencies and regions considering moving towards an active management approach. Through customized workshops, tools, guidance documents, resources, and peer exchanges, the program can assist with technical support to implement ATDM strategies. Importantly, ATDM is not an exclusive program restricted to specific agencies. Every agency that is considering moving towards active and dynamic capabilities can benefit from the ATDM program's efforts.

### WHAT'S NEW

- [Guide for Highway Capacity and Operations Analysis of Active Transportation and Demand Management Strategies](#) (FHWA-HOP-13-042)
- [ATDM Analysis Brief: Example Application \(HOV to HOT\) of ATDM Capacity and Operations Analysis](#) (FHWA-HOP-13-036)
- [ATDM Analysis Brief: Example Application \(Ramp Metering and Demand Management\) of ATDM Capacity and Operations Analysis](#) (FHWA-HOP-13-037)
- [ATDM Analysis Brief: Methodology for Capacity and Operations Analysis of ATDM](#) (FHWA-HOP-13-035)

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Last modified: May 27, 2014





# Thanks for joining us!

- We hope to see you at our next ATDM Webinar in January!

