
# Best Practices & Guidelines for Active Traffic Management

University Transportation Center for Mobility

Webinar

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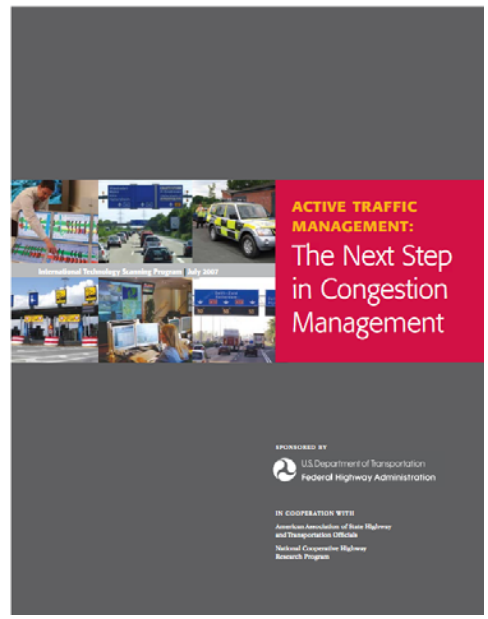
# Webinar Agenda

- Background and Purpose
- Overview of ATM
- Operational Strategies and Examples
- Guidelines
- Final Remarks


# Background of ATM

- 2006 International Scan Tour
- Investigate congestion management programs, policies, and experiences
- A complete package of strategies
- Holistic approach focusing on trip reliability
- Integration and automation key

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# Project Purpose

- Research current practices
- Inventory operational deployments
- Develop high-level guidance
- Increase awareness
  - Create website for information dissemination
  - Prepare project reports
  - Host webinar to share results

# ATM Definition

- Dynamically manage recurrent and non-recurrent congestion based on prevailing traffic conditions
  - Maximize the effectiveness and efficiency of the facility
  - Increase throughput and safety
  - Use of integrated systems
  - Proactive and automated dynamic deployment

# ATM Strategies Addressed

- Shoulder use
- Speed harmonization
- Queue warning
- Dynamic merge control
- Dynamic rerouting and traveler information
- Dynamic truck restrictions


# Shoulder Use

- Also known as hard shoulder running
- Open a shoulder to traffic
- Temporarily increase capacity
- Two common practices
    - All vehicles
    - Only transit vehicles

# Shoulder Use – Overseas


England (*Grant*)

The Netherlands (*Lemke & Irzik*)


Germany (*Kuhn)*

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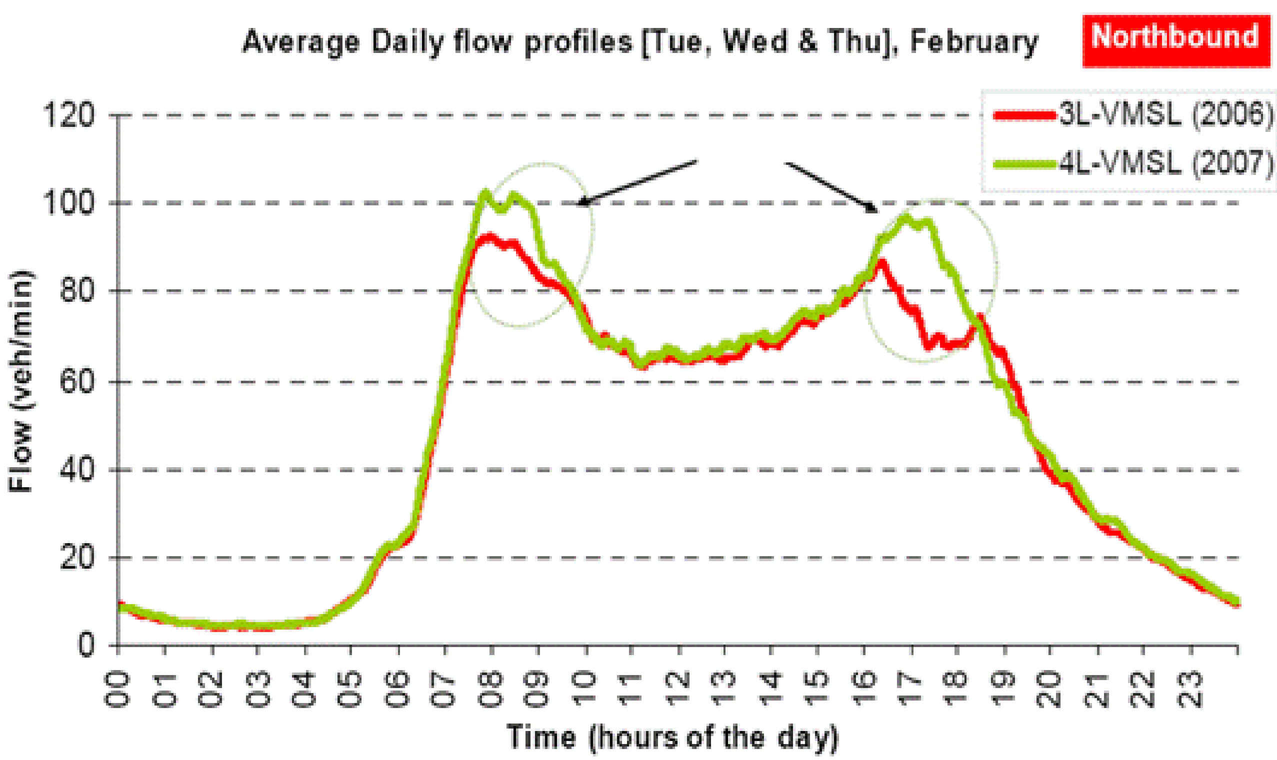
# Shoulder Use – Overseas

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**Experience – England *(Highways Agency)***

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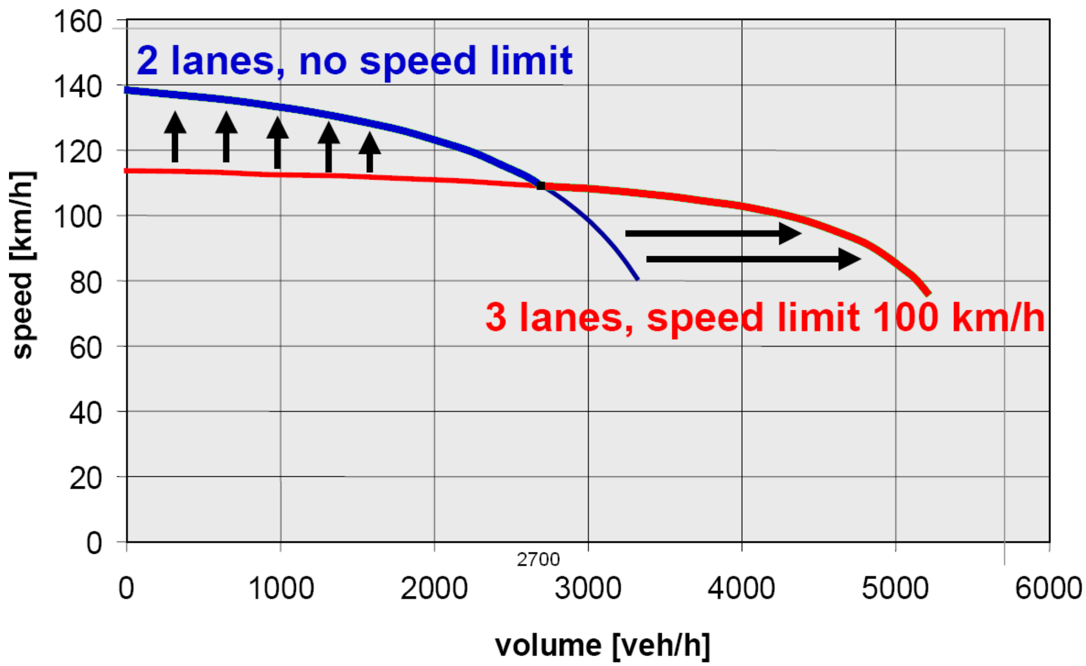
# Shoulder Use – Overseas




**Experience – Germany *(Lemke & Irzik)***

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# Shoulder Use – The United States

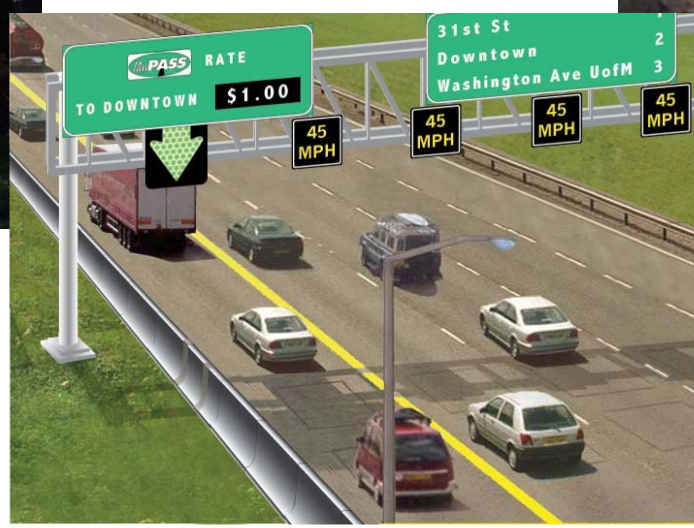
**Bus on Shoulder – Minnesota**

**HOV on Shoulder – Virginia**

**Temporary Shoulder Use – Massachusetts**


# Shoulder Use – The United States


Northern Virginia




Minneapolis, Minnesota


Seattle, Washington

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# Shoulder Use Advantages & Disadvantages

| Design Alternatives | Advantages | Disadvantages |
|---|---|---|
| Use of Left Shoulder | •Not used much for emergencies / enforcement<br>•Least expensive if width available<br>•Trucks often restricted from left lane | •Usually requires striping<br>•Sight distance problems with some median treatments |
| Use of Right Shoulder | •Often easiest to implement | •Right shoulder preferred area for emergency stops / enforcement<br>•Sight distance changes at merge and diverge areas of ramps |
| Use of Both Shoulders | •Not recommended<br>•Use <u>ONLY</u> in extreme cases | •Requires restriping<br>•Safety / enforcement concerns<br>•Incident response longer<br>•Maintenance difficult / expensive |


# Shoulder Use Guidelines – All Vehicles

| Essential Elements | Preferable Elements |
|---|---|
| •LOS E or F for at least 2 hours a day<br>•Segment at least 3 miles in length<br>•No bottleneck downstream<br>•Low entering and exiting volumes at interchanges<br>•10’ shoulder width<br>•ROW for refuge areas and tapers<br>•Sufficient pavement strength | •Active incident management<br>•Connection to TMC<br>•Existing sensors and ITS<br>•Presence of speed harmonization on facility |


# Shoulder Use Guidelines – Transit

| Essential Elements | Preferable Elements |
|---|---|
| •Predictable congestion delays | •Travel time variability higher than 1 minute per 2 miles |
| •LOS D for at least 2 hours a day | •Few conflict points at interchanges |
| •10' shoulder width | •Portion shared with multiple bus routes |
| •Sufficient pavement strength | |
| •Minimum service of 50 buses/hour | |

# Shoulder Use Guidelines – Key Factors

- Typically implemented with speed harmonization
- Signs and lane control signals visible to all vehicles
- Video cameras necessary to check for obstacles
- Ensure guide signs adapt to current used width
- Additional tapers where necessary


# Shoulder Use Guidelines – Data Needs and Impacts

| Data Needs | Potential Impacts |
| --- | --- |
| •Traffic volumes<br>•Travel speeds<br>•Incident presence and location<br>•Shoulder availability | •Increased throughput<br>•Increased capacity<br>•Increased trip reliability<br>•Delay onset of freeway breakdown |

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# Speed Harmonization

- Variable speed limits, dynamic speed limits, dynamic speed displays
- Purpose
  - Congestion management
  - Weather conditions
- Mandatory or advisory

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# Speed Harmonization – Overseas


Denmark *(Kuhn)*


Germany *(Lemke & Irzik)*


The Netherlands *(Kuhn)*


# Speed Harmonization – U.S.


**Seattle, Washington**

**St. Louis, Missouri**


**Snoqualmie Pass, Washington**


**Minneapolis, Minnesota**

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# Speed Harmonization Guidelines

| Essential Elements | Preferable Elements |
|---|---|
| •LOS E or F for 3 hours during peak period and 5 hours per day<br>•ROW for overhead gantries and DMS<br>•1 location where queues regularly form<br>•5 incidents related to queuing, merging/diverging per week | •Willingness to automate deployment<br>•Existing ITS and connections to TMC |

# Speed Harmonization – Key Factors

- Success closely linked to compliance
- Implement in response to an actual situation
- Signs have to be visible to all vehicles


# Speed Harmonization – Data Needs and Impacts

| Data Needs | Potential Impacts |
|---|---|
| •Weather conditions<br>•Pavement conditions related to weather<br>•Traffic volumes<br>•Travel speeds<br>•Incident presence and location | •Increased throughput<br>•Decrease in primary incidents<br>•Decrease in incident severity<br>•More uniform speeds<br>•Decreased headways<br>•More uniform driver behavior<br>•Increased trip reliability<br>•Delay onset of freeway breakdown<br>•Reduction in traffic noise, emissions, and fuel consumption |

# Queue Warning

- Inform travelers of queues ahead
  - Recurrent congestion
  - Non-recurrent congestion
- Based on dynamic traffic detection
- Uses warning signs and/or flashing lights
- May be used with speed harmonization


# Queue Warning – Overseas

**Germany (*Kuhn)***


**Norway (*ViaNordica*)**


**The Netherlands (*Kuhn)***

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# Queue Warning – U.S.


**Tested in Texas (*Wiles et al*)**


**Illinois (*Wiles et al*)**


**Missouri (*Wiles et al*)**

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# Queue Warning Guidelines

| Essential Elements | Preferable Elements |
|---|---|
| •LOS E or F for 2 hours during peak period<br>•Presence of queues in predictable locations<br>•Sight distance restricted by geometric features or lighting<br>•ROW for overhead gantries and DMS<br>•5 incidents related to queuing, merging/diverging per week | •Large mix of high profile vehicles or inability to control speeds<br>•Willingness to automate deployment<br>•Existing ITS and connections to TMC |

# Queue Warning – Key Factors

- More effective when deployed with speed harmonization
- When implemented with speed harmonization, signs and lights need to be visible to all vehicles
- An expert system that automatically deploys strategy based on prevailing roadway conditions

# Queue Warning – Data Needs and Impacts

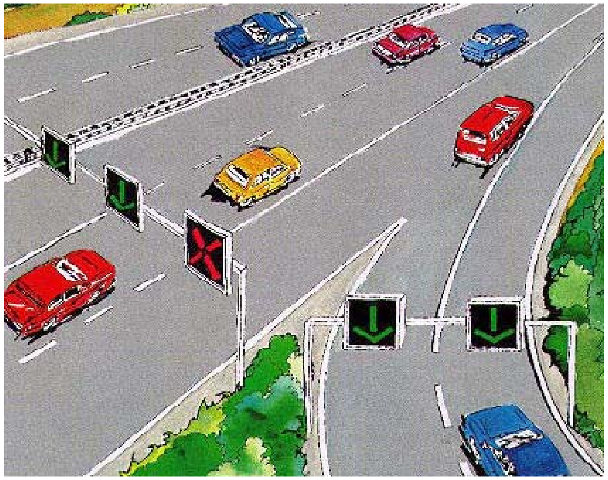
| Data Needs | Potential Impacts |
|---|---|
| •Traffic volumes<br>•Travel speeds<br>•Incident presence and location | •Decrease in primary incidents<br>•Decrease in secondary incidents<br>•Decrease in incident severity<br>•More uniform speeds<br>•Decreased headways<br>•More uniform driver behavior<br>•Increased trip reliability<br>•Reduction in traffic noise, emissions, and fuel consumption |

# Dynamic Merge Control

- Also known as junction control
- Dynamically assigns priority access to heavier movement
- Implemented at interchanges and ramps

# Dynamic Merge Control

At an Exit with Hard Shoulder Running, The Netherlands (*PB)*



At an Entrance with Hard Shoulder Running, Germany (*Bolte)*


# Dynamic Merge Control Guidelines

| Essential Elements | Preferable Elements |
| --- | --- |
| •Significant merging volumes<br>•Available capacity on GP lanes upstream of interchange with no worse than LOS E impact<br>•Non-simultaneous peak traffic upstream on the GP lanes and merging lanes | •Active incident management<br>•Existing ITS and connections to TMC<br>•Combination with shoulder use |


# Dynamic Merge Control – Key Factors

- Effective implementation uses lane control signals on main lanes and merging lanes
- Expert system that automatically deploys strategy based on roadway conditions
- Bypass lane for emergency vehicles, transit or other exempt users
- Can be implemented with shoulder use with appropriate signage


# Dynamic Merge Control – Data Needs and Impacts

| Data Needs | Potential Impacts |
|---|---|
| •Maximum capacity of upstream GP lanes<br>•Traffic volumes on GP lanes and merging ramps<br>•Travel speeds on GP lanes and merging ramps<br>•Incident presence and location | •Increased throughput<br>•Increased capacity<br>•Decrease in primary incidents<br>•More uniform speeds<br>•More uniform driver behavior<br>•Increased trip reliability |

# Dynamic Rerouting and Traveler Information

- Dynamic provision of rerouting information
- DMS or rotating panels
- Substitution
  - Suggestion of alternate or secondary route
  - Original route no longer displayed
- Addition
  - Original route maintained


# Dynamic Rerouting and Traveler Information


**The Netherlands (*Middleham)***


**Germany (*Kuhn)***


**Germany (*Vortsch)***

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# Dynamic Rerouting Guidelines

| Essential Elements | Preferable Elements |
|---|---|
| •LOS E or F for 2 hours during peak period<br>•3 incidents related to server congestion<br>•Viable parallel corridor to accept rerouted traffic no farther than 2 miles away<br>•Available capacity on parallel route<br>•ROW for overhead gantries | •Existing ITS and connections to TMC<br>•Combination of speed harmonization and shoulder use |

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# Dynamic Rerouting – Key Factors

- Agency commitment to providing alternate route information to users
- More effective is deployed with speed harmonization and temporary shoulder use
- Need adequate installation of sign gantries at critical locations
- Connectivity with TMCs to coordinate alternate route information


# Dynamic Rerouting – Data Needs and Impacts

| Data Needs | Potential Impacts |
|---|---|
| •Traffic volumes<br>•Travel speeds<br>•Weather conditions<br>•Incident presence and locations<br>•Conditions and availability of alternate routes | •Increased throughput<br>•Decrease in primary incidents<br>•Decrease in secondary incidents<br>•More uniform driver behavior<br>•Increase trip reliability |


# Dynamic Truck Restrictions

- Dynamically restrict heavy vehicles to designated lane(s)
- Can increase capacity and speeds
- Can improve safety
- More flexibility in implementing restrictions

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# Dynamic Truck Restrictions


The Netherlands

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# Dynamic Truck Restrictions Guidelines

| Essential Elements | Preferable Elements |
| --- | --- |
| •Significant proportion of truck traffic<br>•ROW for overhead gantries<br>•No left side exits in the controlled section | •Existing ITS and connections to TMC<br>•Combination with speed harmonization |

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# Dynamic Truck Restrictions – Key Factors

- Agencies may need to seek enabling legislation and related laws
- Important to have an expert system that automatically deploys strategy based on prevailing roadway conditions
- Sign gantries sufficient to ensure at least one sign displaying restrictions visible at all times

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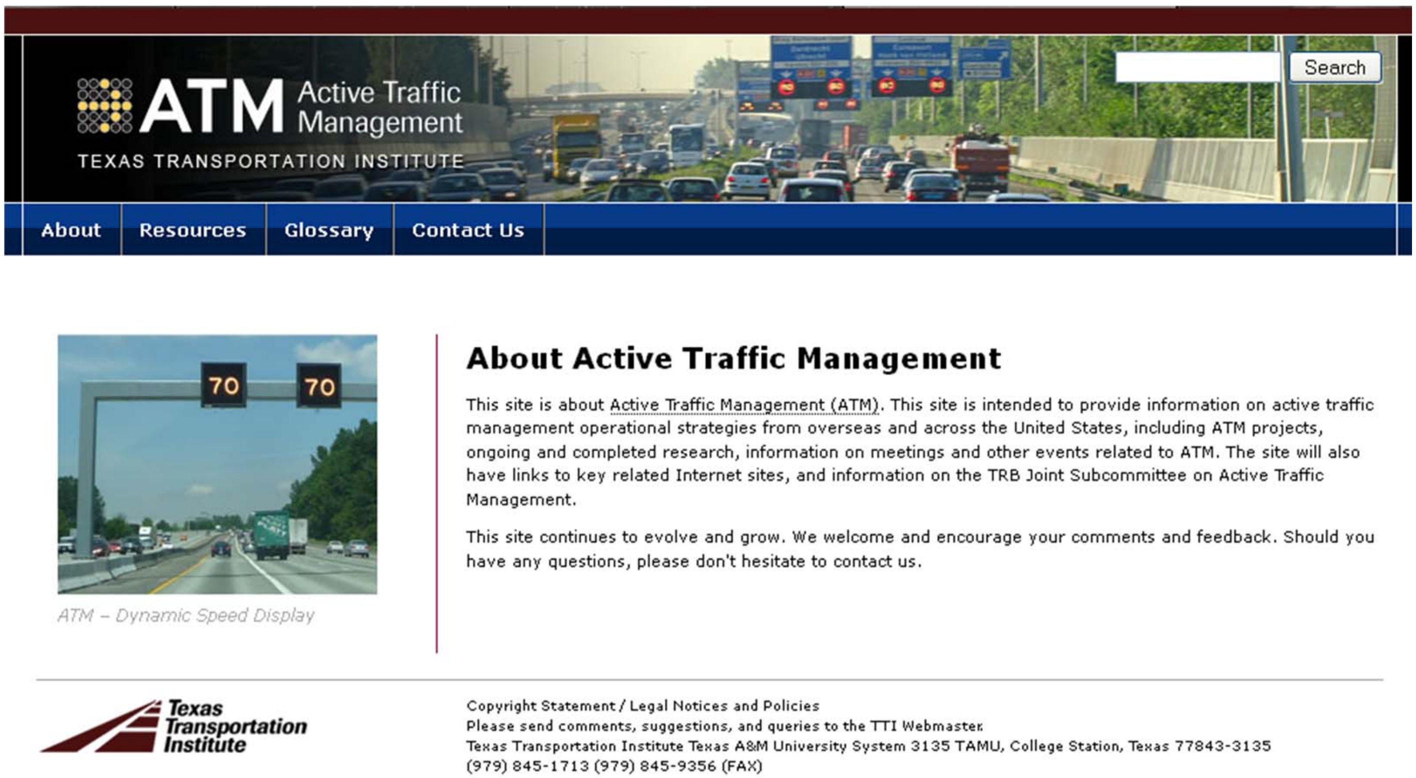
# Dynamic Truck Restrictions – Data Needs and Impacts

| Data Needs | Potential Impacts |
| --- | --- |
| •Traffic volumes, including truck volumes<br>•Travel speeds<br>•Weather conditions<br>•Incident presence and locations | •Increased throughput<br>•Increased capacity<br>•More uniform speeds<br>•More uniform driver behavior<br>•Increased trip reliability<br>•Reduction in emissions<br>•Reduction in fuel consumption |

# ATM Inventory

- Location and strategy
- Operational hours
- Geometric features
- Traffic control devices
- ITS elements
- Performance measures
- Costs
- Enforcement
- Maintenance
- Incident management
- Safety experience
- Liability issues
- Outreach and education
- Legislative issues


# ATM Website

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# ATM Inventory

- ATM can have a positive impact on transportation networks
- Inventory and domestic experience will continue to expand
- Numerous federal initiatives
- More to come!


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