

Active Traffic Management (ATM)

AASHTO Subcommittee on
Traffic Engineering

Louis G. Neudorff
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Overview of Presentation

- What is Active Traffic Management (ATM)
 - ATDM Context
 - ATM Strategies
 - Potential Benefits
- Overview of FHWA Guidance for Determining Feasibility of ATM
 - Some New Jersey Examples
- ATM Issues
 - Gantry Spacing
 - MUTCD “Gaps”
- Questions

Active Traffic Management (ATM)

“The ability to **dynamically manage** recurrent and non-recurrent congestion based on **prevailing and predicted traffic conditions**. Focusing on trip reliability, it maximizes the effectiveness and efficiency of the facility. It increases throughput and safety through the use of **integrated systems with new technology**, including the **automation of dynamic deployment** to optimize performance quickly and without delay that occurs when operators must deploy operational strategies manually. ATM approaches focus on influencing travel behavior with respect to lane/facility choices and operations.”

<http://ops.fhwa.dot.gov/atdm/approaches/atm.htm>

Part of Active Transportation and Demand Management (ATDM)

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

- **Active Demand Management (ADM):** Strategies intended to reduce or redistribute travel demand to alternate modes or routes
- **Active Parking Management (APM):** strategies designed to affect the demand on parking capacity.



ATM Strategies

Dynamic Speed Limits (DSpL):

- Adjust speed displays based on real-time traffic, roadway, and/or weather conditions.
- May be enforceable (legal “limits”) or advisories



Dynamic Lane Use Control / Dynamic Lane Assignment (DLA)

- Closing / opening individual traffic lanes as warranted, providing advance warning
- Often installed in conjunction with dynamic speed limits



ATM Strategies

Queue Warning (QW):

- Real-time displays of warning messages to alert motorists that queues or significant slowdowns are ahead
- May be included as part of DSpL / DLA strategies.



Dynamic Shoulder Lane (DSHL):

- Use of the shoulder as a travel lane(s) based on congestion levels / in response to incidents, events, or other conditions
- May also be used as a managed lane (e.g., bus-only)



ATM Strategies

Dynamic Junction Control:

- Allocate lane access on mainline and ramp lanes in interchange areas
- Make lanes through only / exit & entry / combination
- Can be a form of dynamic shoulder lanes in area of interchange.



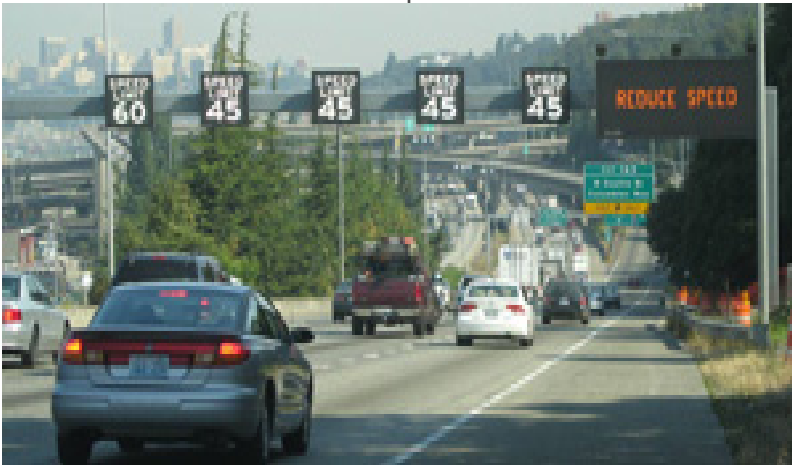
Other ATM Strategies

- Adaptive Ramp Metering
- Transit Signal Priority
- Adaptive Signal Control
- Dynamic Lane Reversal

ATM Benefits - US

Seattle I-5
(7-miles NB)

DSpL, DLA,
QW



- A before-and-after study (3 years for each period) showed total crashes decreased 4.1 percent along the ATM segment.
- During the same period, the southbound segment of I-5 (without ATM) experienced a 4.4 percent increase in the number of crashes.
- Segment already actively managed via ramp metering and incident management

ATM Benefits - US

Minneapolis
I-35

DSpL, DLA,
QW
DShL for HOT



- On average, the morning peak experienced 17 percent less congestion with the DSpL system in place.
- The instances and spread of extreme congestion waves reduced.
- Crash reductions in first 6-months
 - 9% (fatal & injury)
 - 20% (property damage)

ATM Benefits - US

Los Angeles
Northbound
State Route 110
connector to
northbound I-5

Junction
Control

- Average ramp delay reduced from greater than 20 minutes to under 5 minutes.
- Crashes decreased 30 percent



ATM Benefits - US

Illinois
(Chicago Area)

Bus on
Shoulder



- Bus on-time performance increased from 68 to 92 percent.
- Ridership increased threefold (requiring an increase in number of buses).
- There were no impacts on safety.

ATM Benefits – Europe

Summary From FHWA Scanning Tour

- 3-7% increase in average throughput during congested periods
- 3-22% increase in overall capacity (mostly DShL)
- 3-30% decrease in primary crashes
- 40-50% decrease in secondary crashes
- Increased trip reliability
- Ability to delay the onset of freeway breakdown



FHWA ATM Feasibility and Screening Guide

- Frequent question during FHWA Workshops on ATDM
 - ATM looks great. How do I get started?
- Guidance developed to assist transportation agencies in making informed investment decisions regarding ATM concepts and strategies. Answer the following questions:
 - What roadway networks and facilities would be best suited for ATM in my region?
 - What specific or combination of ATM strategies would work best?
 - What would be the range of expected benefits?
 - What would be the expected costs (capital and ongoing)?
- Determine feasibility of ATM prior to committing significant resources – **MAKE A BUSINESS CASE FOR ATM**

Guidance Activities / Steps

1 - Get Started - Preparation

2 - Assess Agency Policies and Capabilities for ATM

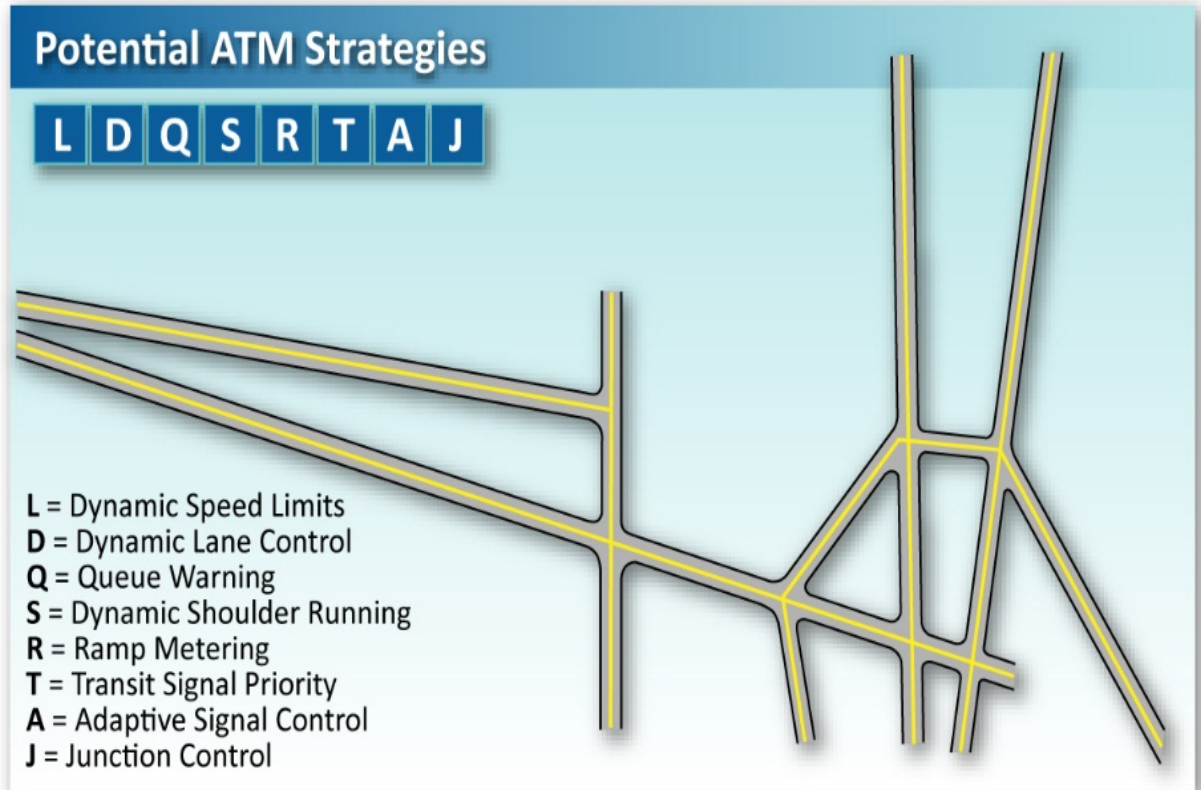
3 - Identify Major Roadway Segments for Potential ATM

4 – Analyze and Prioritize Individual Roadway Links and ATM Strategies

5 - Estimate Benefits and Costs; Finalize Preliminary ATM Recommendations

Get Started – Preparation

- Ensure ATM supports regional goals
- Identify relevant objectives
- Identify network
- Collaborate with stakeholders
- Commence data collection
- Review recent literature



Common ATM Stakeholders

- State and Local DOTs
 - Senior Management
 - Operators
 - Planning
 - Maintenance
 - Engineering & Design
- Transit
- MPO
- Enforcement
- FHWA

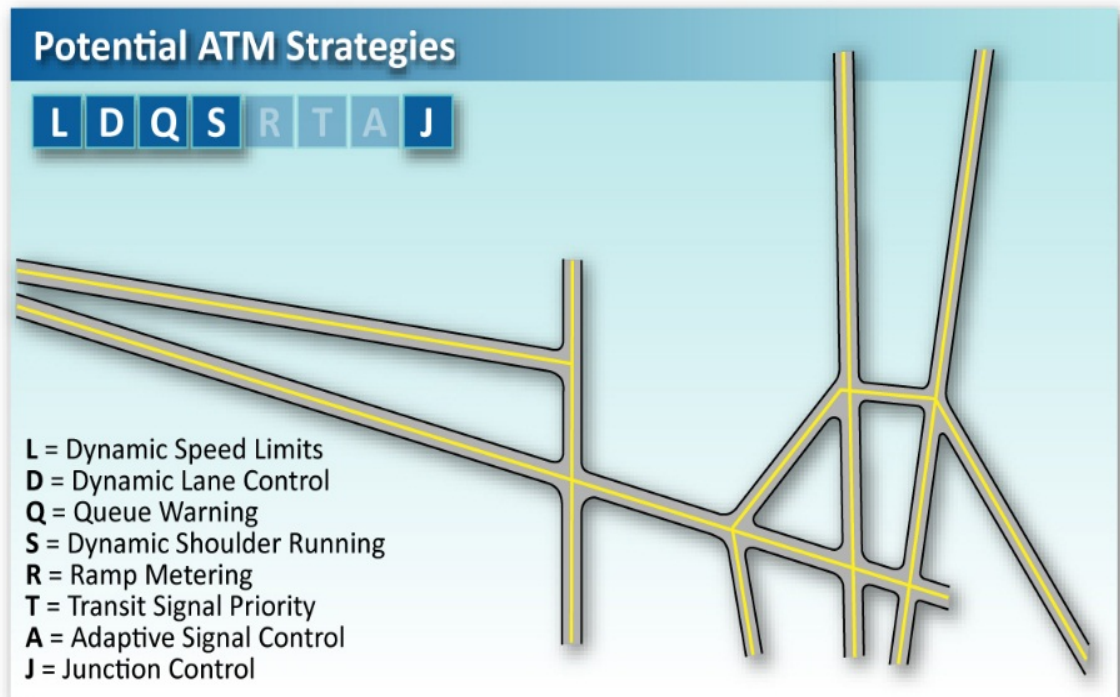
Engagement Activities

- Workshops
- Peer Reviews
- FHWA

Public outreach and education very important; but comes later.

Assess Agency Policies & Capabilities for ATM

- Identify applicable ATM strategies in terms of network features, agency policies and legal considerations
- Ensure supporting institutional framework is in place (CMM).



Graphic: Signal-based strategies not applicable to freeway network. DOT has “policy” against ramp metering

Legal and Policy Considerations

- Speed limits or advisories
 - Maximum allowable spacing
 - Opinion of enforcement agencies
 - “Chain of evidence” for enforcement
- Use of shoulder as travel way
 - Passing on shoulder
 - Lane restrictions for trucks
- Can impact estimated costs; time required for new legislation

Workforce & Staffing

- Critical to understand changes to operator roles & responsibilities and impact to workload
 - Operators as “Stakeholders”
- Workforce and staffing needs vary by ATM strategy



Examples of Workforce and Staffing Needs Based on ATM Strategy

Operator-Driven
Less Automation

Operator-Monitored
More Automation

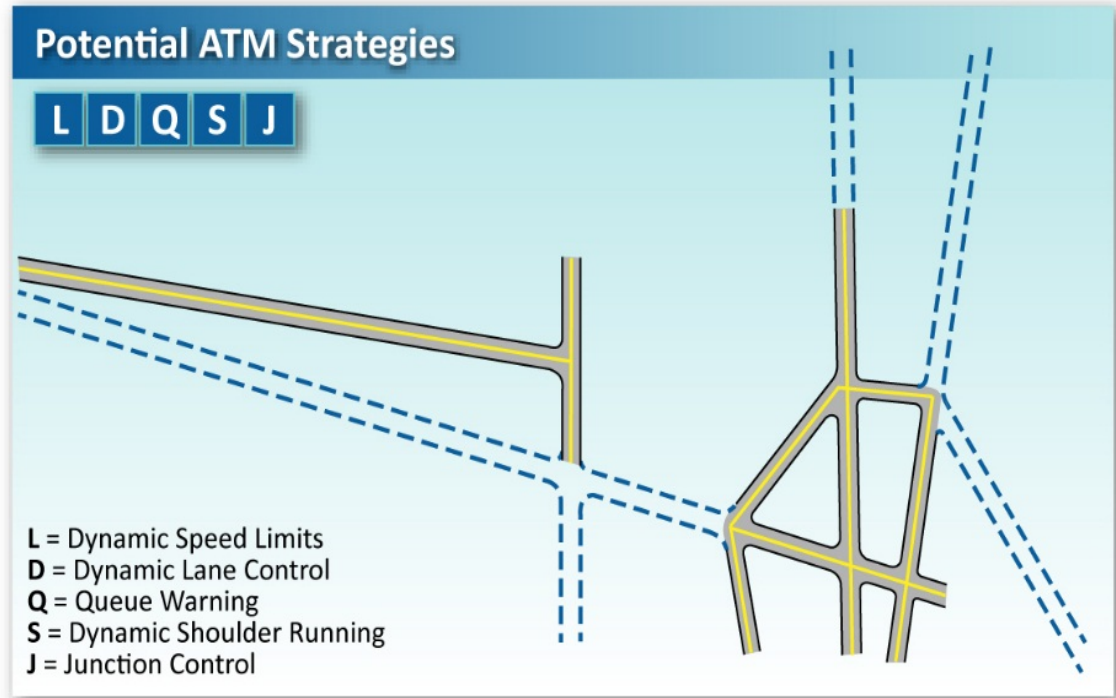
**Lane Control
(Decision
Support)**

**Dynamic Shoulder
Lanes**

**Dynamic
Speed Limits
Adaptive
Signal**

Identify Major Roadway Segments for Potential ATM

- Determine level of TSM&O deployment along segments.
- Analyze segments based on congestion, crash rates, bottlenecks, and other considerations



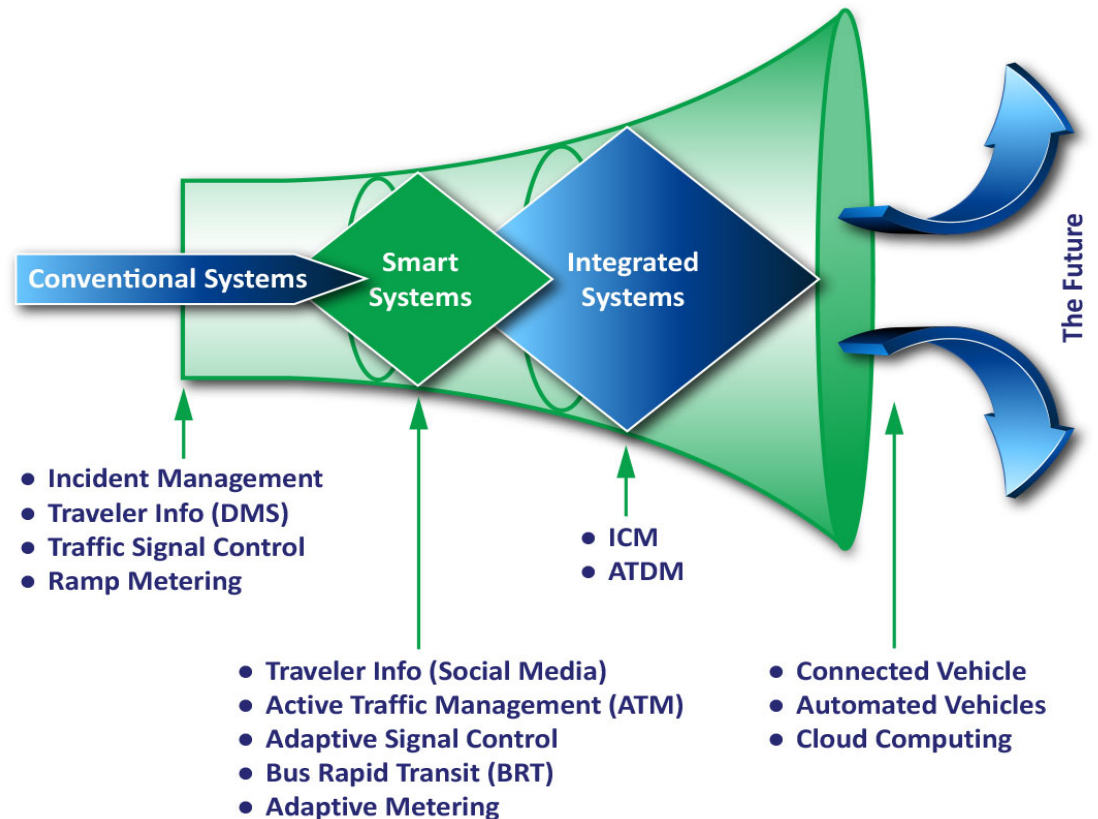
Graphic: “Blue dot” segments are less likely to benefit from ATM relative to others

Importance of Having Some TSM&O and ITS Already in Place

ATM as the “Next Step in Congestion Management”

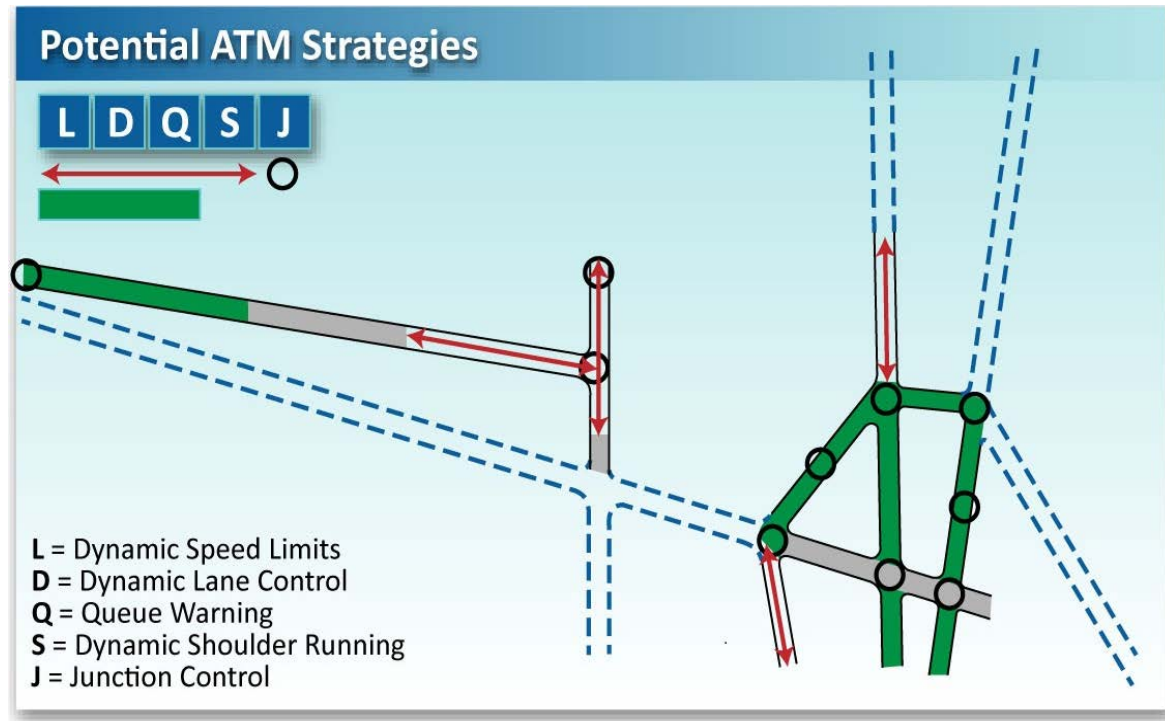


A continuum – not a “quantum leap”



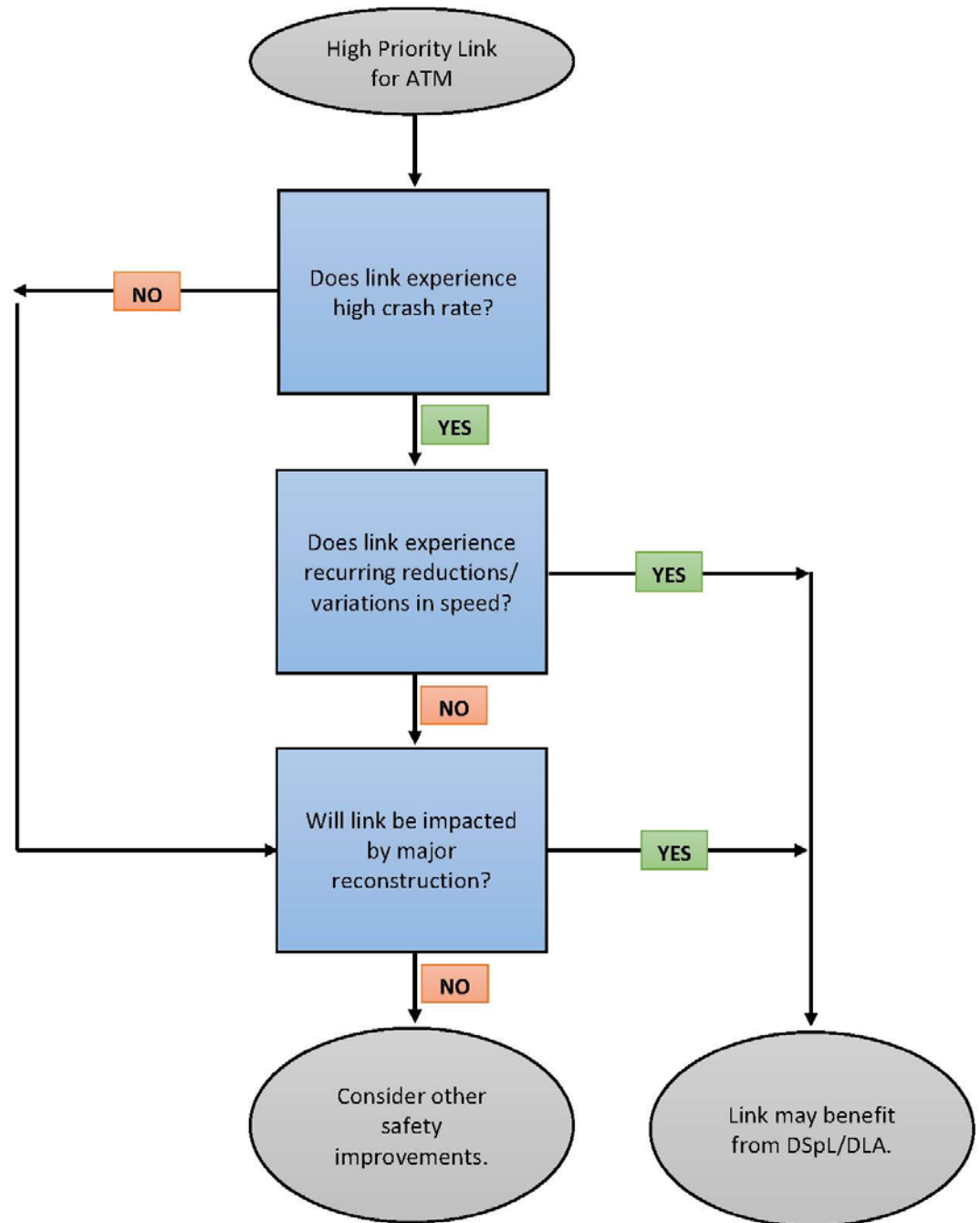
Analyze Individual Links and ATM Strategies

- Analyze & prioritize individual links for ATM deployment
- Identify ATM strategies for each prioritized link
- Combine strategies for each link; **provide consistency across the network**



Graphic: Strategies L, D, and Q are recommended for “green” links with strategy S also included for “red arrow” links.

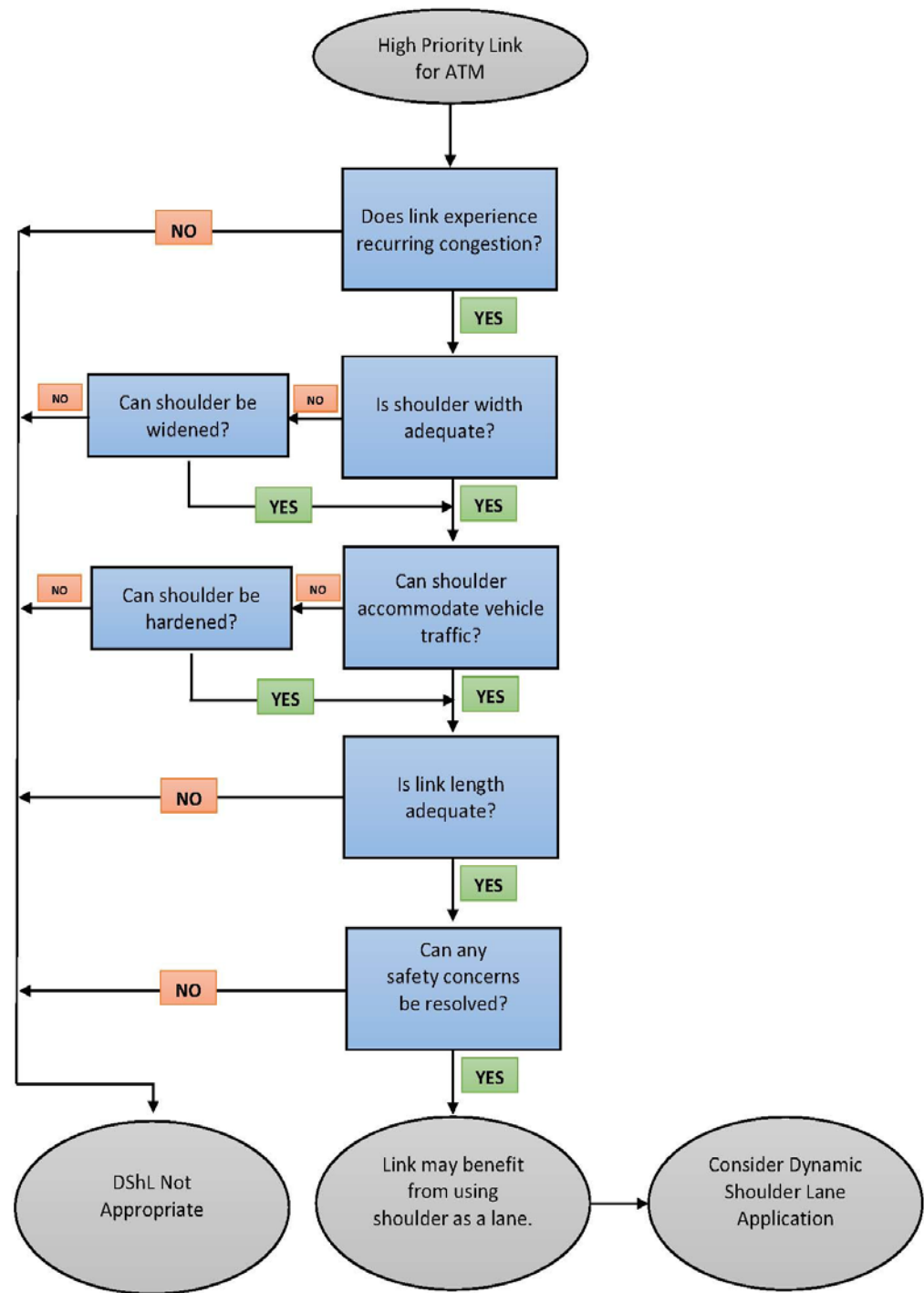
Dynamic Speed Limits & Dynamic Lane Assignment



New Jersey Example

SRI	MP	ALL CRASHES		SIDE SWIPES		REAR END	
		EB/NB	WB/SB	EB/NB	WB/SB	EB/NB	WB/SB
00000078__	4.5	39	39	12	13	9	16
00000078__	3.5	25	15	10	2	4	6
00000078__	2.5	18	23	4	4	1	11
00000078__	1.5	20	23	3	6	6	10
00000078__	0.5	19	24	12	6	1	14
00000080__	68.5	69	38	17	13	19	9
00000080__	67.5	129	79	32	26	39	19
00000080__	66.5	89	112	22	33	30	42
00000080__	65.5	84	213	22	58	35	95
00000080__	64.5	97	114	34	26	27	60
00000080__	63.5	142	128	39	29	49	41
00000080__	62.5	253	186	48	34	105	96
00000080__	61.5	97	201	16	39	37	97
00000080__	60.5	230	283	52	59	102	135
00000080__	59.5	167	381	40	67	89	173
00000080__	58.5	239	363	45	73	122	136
00000080__	57.5	197	241	40	43	100	72
00000080__	56.5	146	139	27	41	49	29
00000080__	55.5	93	142	24	30	37	44
00000080__	54.5	98	104	23	24	44	38
00000080__	53.5	151	171	23	68	32	51
00000080__	52.5	71	86	11	17	32	25
00000080__	51.5	42	59	7	7	20	16
00000080__	50.5	34	58	6	14	14	19

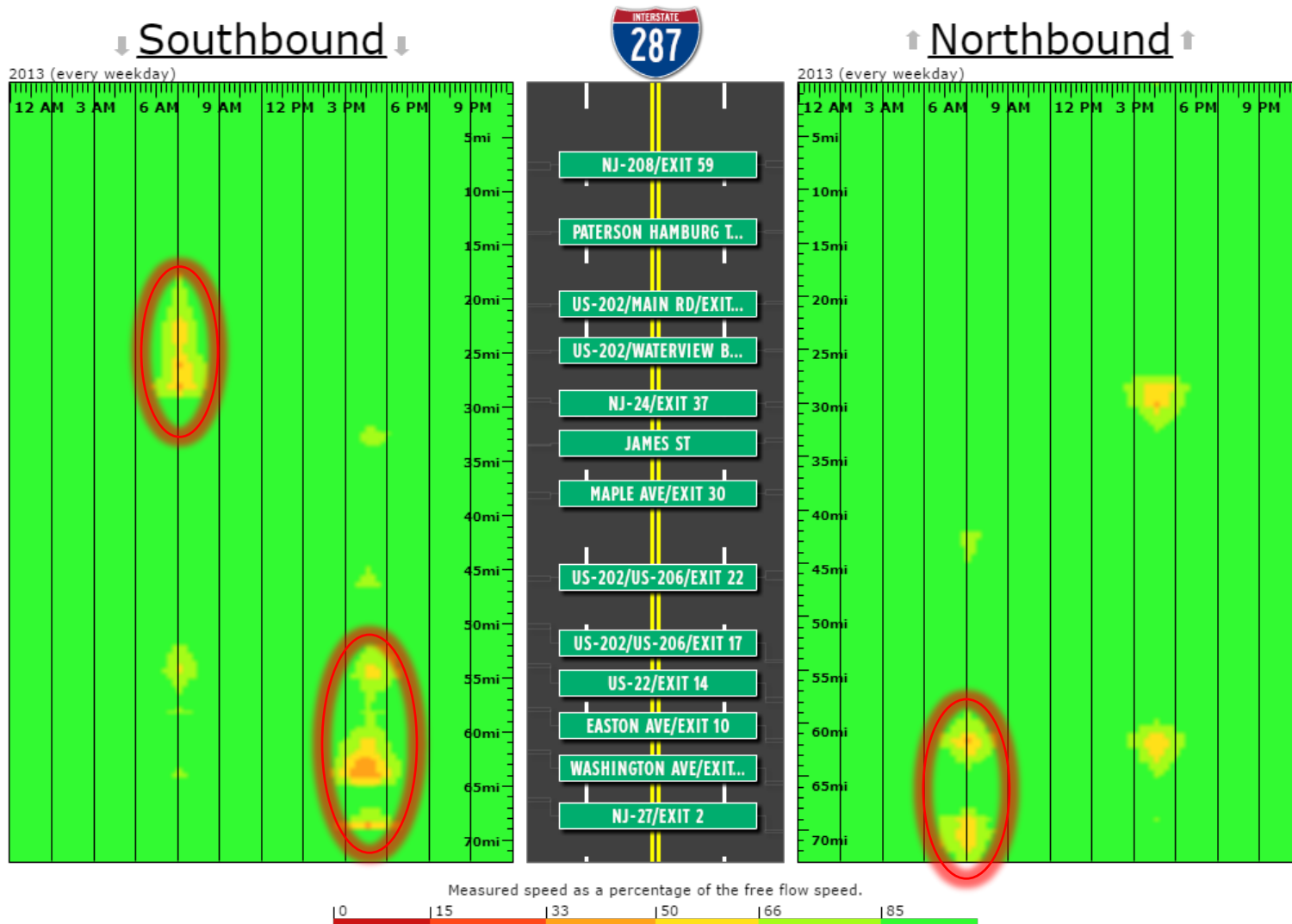
Dynamic Shoulder Lanes



New Jersey Example

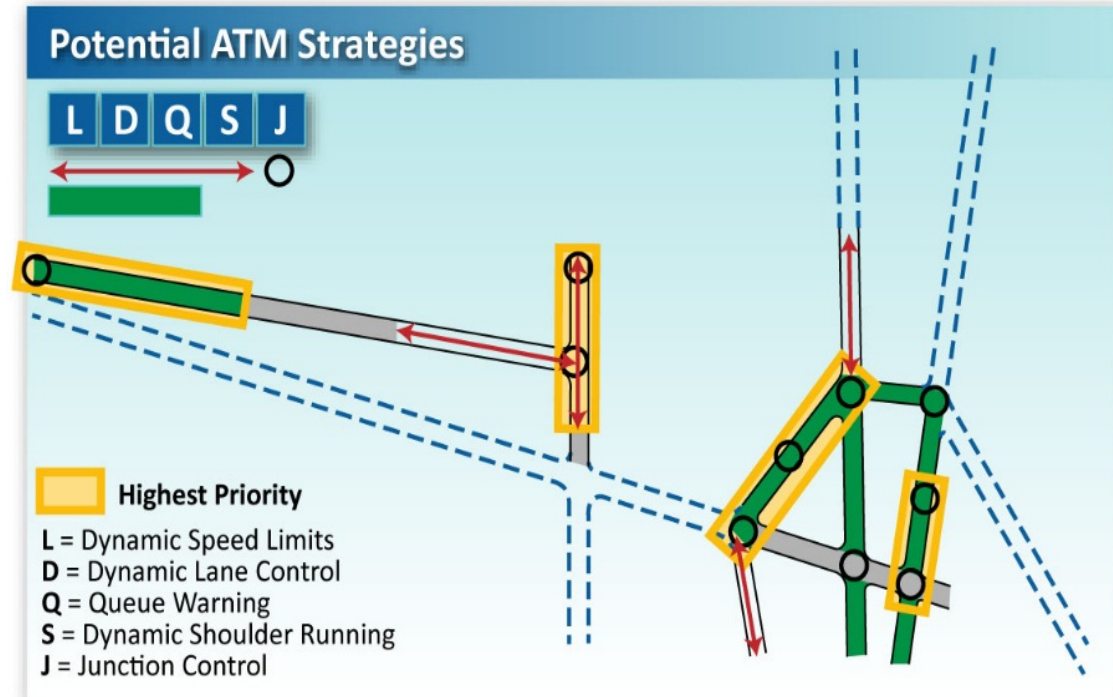
Congestion on I-287

Averaged by 1 hour for 2013 (every weekday)



Estimate Benefits & Costs

- Consider key ATM cost factors
- Perform high-level estimates of benefits and costs using available tools
 - Life-cycle
- Refine priorities & recommendations



Graphic: Segments outlined in yellow provide the greatest estimated B/C ratio

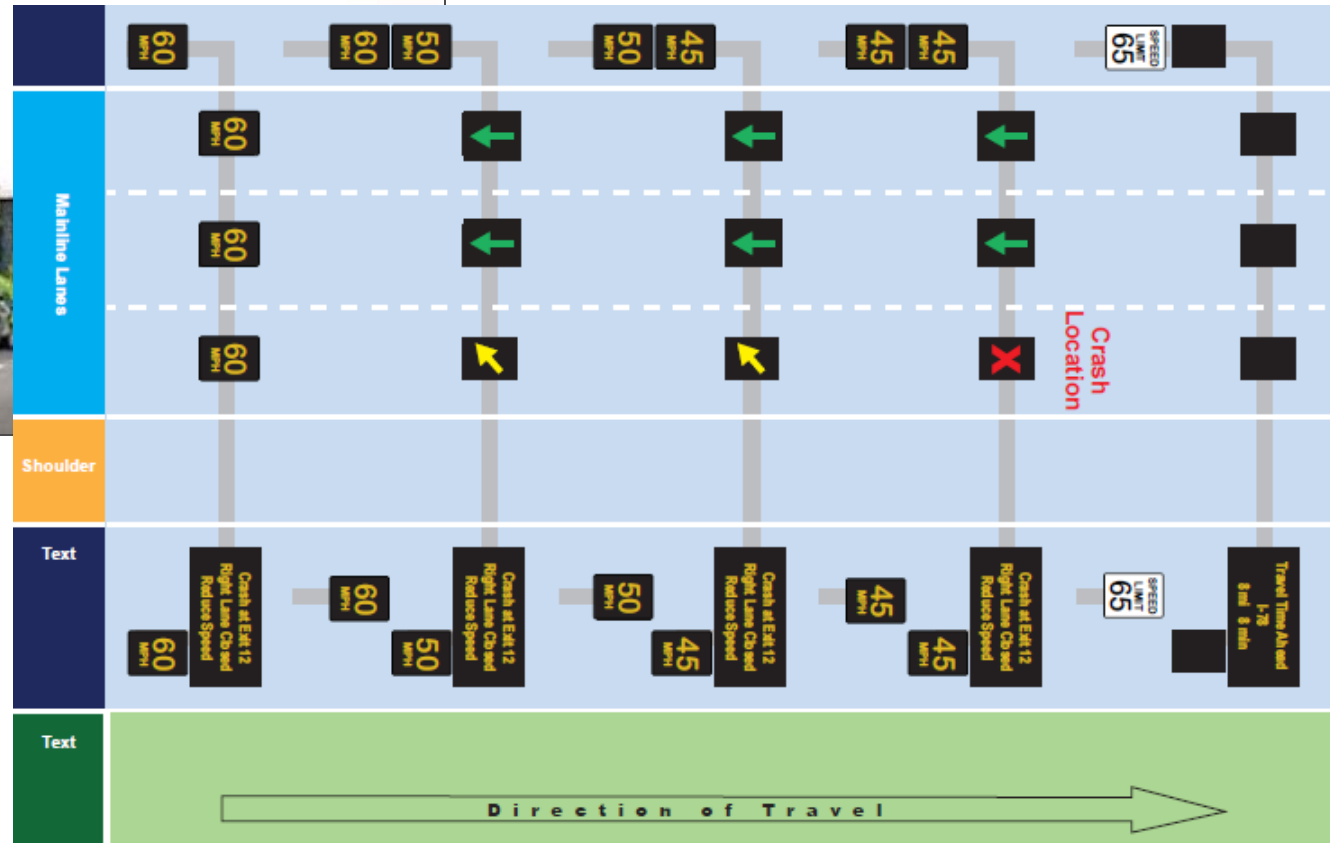
Issue – Gantry Spacing and Layout

- Concerns with costs of frequent “full” gantries
 - Every ½ - mile
- MUTCD requirements on guide sign distances
 - 600 to 800 feet
- Significant testing in UK of different spacing / layouts
 - Driver simulations
 - Visualization / response monitoring software

Moving towards more of a **HYBRID** approach

- Longer spacings between full gantries (e.g., after on ramps)
- Use of side-mounted signs in-between
- Significant reduction in costs

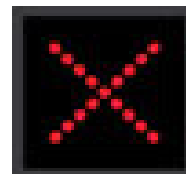
Hybrid Approach Examples





Issue – Sign Displays and MUTCD Conformance

- Advisory Speed Limit Displays
 - MUTCD: Can only be used with warning sign
- Dynamic Lane Assignment



Seattle / Washington DOT		Minneapolis / Minnesota DOT	
	Merge Left		Drivers Should Proceed With Caution
	Merge Right		Merge Right
	Merge Left or Right		Merge Either Direction

Thank You

Contact:

Lou.Neudorff@ch2m.com

