MANAGED LANES

PRESENTED TO

KANSAS CITY CHAPTER
OF THE INSTITUTE OF
TRANSPORTATION ENGINEERS

PRESENTED BY

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MARCH 8, 2012



AGENDA

- Why are transportation improvements needed?
- What are managed lanes?
- I-35 Managed Lanes Study
- I-35 Bus on Shoulder



WHY ARE TRANSPORTATION IMPROVEMENTS NEEDED?

WHAT DOES THE FUTURE HOLD FOR TRANSPORTATION?





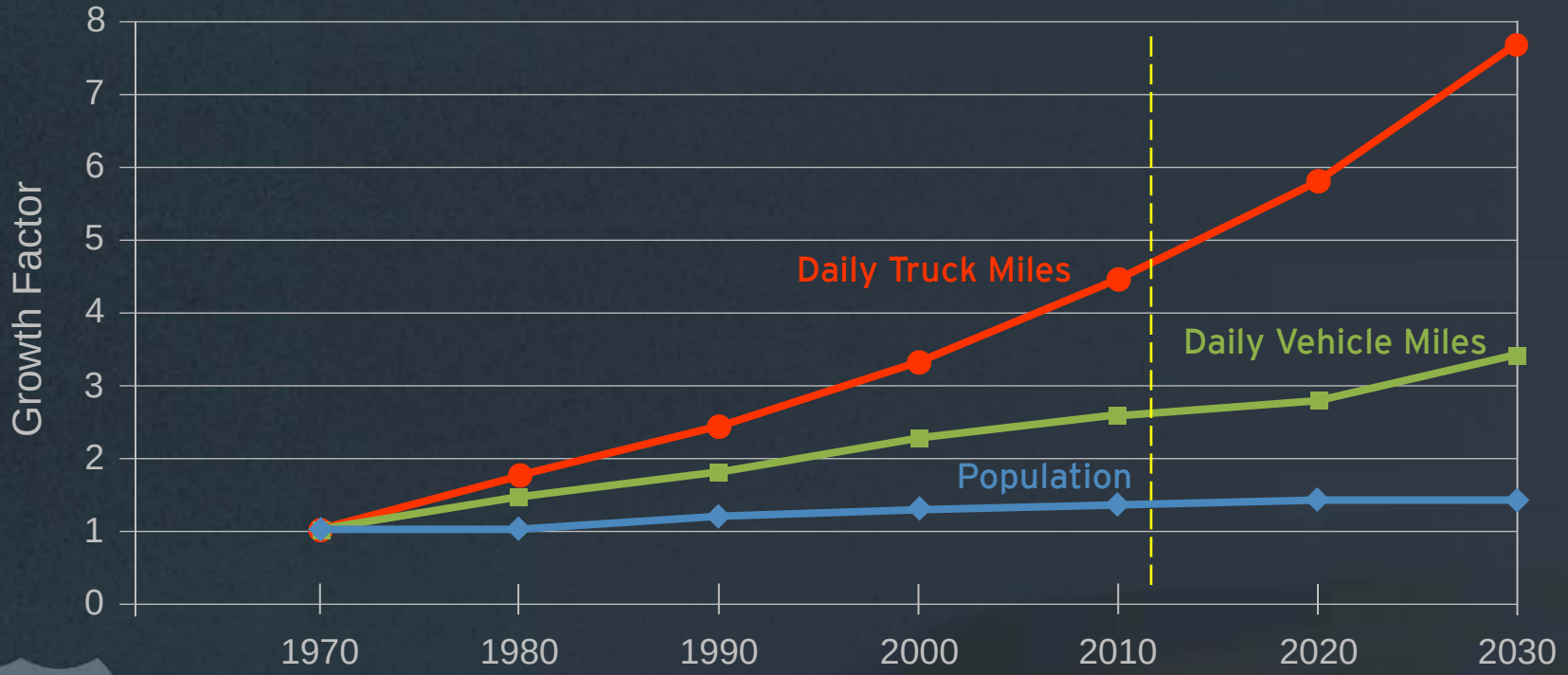


National Perspective

- Infrastructure received a “D” from ASCE
- 27.1% of our nation’s bridges are structurally deficient/obsolete
- Bad roads cost U.S. motorists $54 billion per year - $275 per motorist
- Americans spend an average of 46 hours per year stuck in traffic – 3.5 billion hours
- Motor fuel tax is inadequate
- Increase in fuel-efficient vehicles are eroding the purchasing power of gas tax
- New construction costs climbing

WHAT DOES THE FUTURE HOLD FOR TRANSPORTATION?

Kansas Population and Travel Growth Trends



MANAGED LANES

Source: 2008 KDOT Long Range Transportation Plan

Kansas Department of Transportation

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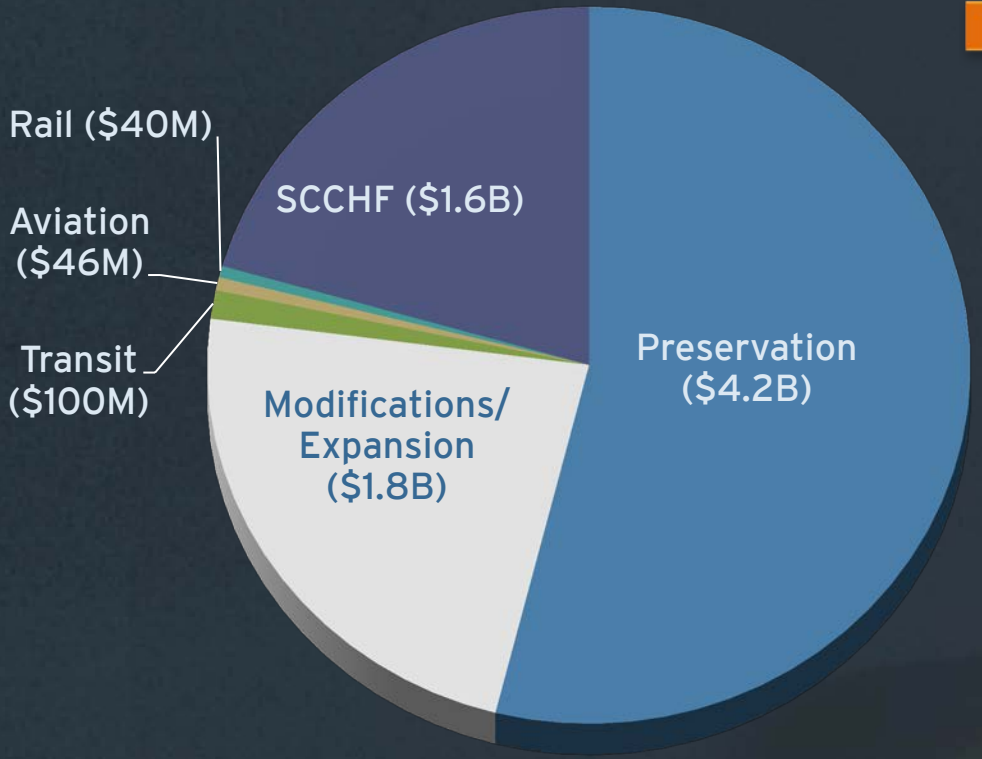
WHAT DOES THE FUTURE HOLD FOR TRANSPORTATION?

Guiding Principles

- Preserve the transportation system
- Make travel safer
- Support economic growth



TWORKS FUNDING



TWORKS

MANAGED LANES

Source: TWorks

Kansas Department of Transportation

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TWORKS FUNDING

ID	Project Description	Scope/Options	FY '16 Cost (millions)	Length (miles)	Notes
	K-18 Expansion in Riley County		$96	6	Plans and Right-of-Way are ready
1	Wildcat Creek to 1 mile E. of Scenic Drive	4-lane freeway	$71	4	
2	1 mile E. of Scenic Drive to K-113/Seth Child	4-lane freeway	$25	2	
	K-4 Expansion in Shawnee and Jefferson County		$100	7	Preliminary plans ready
3	Oakland Expressway (US-24) to 54th St	4-lane freeway	$75	3	New alignment
4	54th St to Meriden	4-lane expressway	$25	4	
	US-24 Expansion in Shawnee County	4-lane expressway	$118	9	
5	Silver Lake to Countryside Rd (2 Mi W of US-75)	4-lane expressway	$75	7	
6	Countryside Rd (2 Mi W of US-75) to existing 4-lane in Topeka	4-lane expressway	$43	2	Plans ready, inc. Menoken Rd IC and RR Overpass
7	**US-36 Expansion** from Troy to Wathena in Doniphan County	4-lane expressway	$38	6	
8	**US-50 Expansion** in Lyon County from Chase County to Emporia	4-lane expressway	$29	8	
11	**New Interchange on I-35** for KC Intermodal in Johnson County		$25	—	Letting Scheduled Jan 2012
12	**The Gateway Project: I-435/I-35/K-10**		$588	—	Plans underway
12A	Phase: I-35 from 119th to I-435 (Yellow)		$16	—	Scheduled to be let spring 2012
12B	Phase: K-10 eastbound movements to I-435 and I-35 (Orange)		$249	—	
13	**I-35 Expansion** in Johnson County		$280	9	
13 A	Old US-56 to 119th St	Add lanes	$104	4	
13 B	I-35/I-435/K-10 to US-69	Add lanes	$113	3	
13 C	US-69 to 67th St	Add lanes	$63	2	
16	**South Lawrence Trafficway** (US-59 to K-10) in Douglas County	4-lane freeway	$188	7	Possible Tolling, Plans underway
17	**K-10 Expansion** from K-7 to I-435 in Johnson County	8-lane freeway	$240	4	Possible Tolling, Incl. K-7/K-10 IC
	K-7 Expansion north of I-35 in Johnson County		$294	4	
18	I-35/K-7 Interchange reconstruction		$139	—	New alignment on Lone Elm
19	I-35 to 127th Street	4-lane freeway	$155	4	
20	**K-7/I-70 Interchange** reconstruction in Wyandotte County		$411	—	Plans underway
20 A	Phase: Ramps in SW and NW quadrants & I-70 from K-7 to 110th		$90	—	
20 B	Phase: Ramps in SE and NE quadrants		$50	—	
21	**K-7 Expansion** from I-70 to US-24/40 in Wyandotte County	4-lane freeway	$20	1	
22	**I-435 and US-69 Improvements** in Johnson County		$601	11	Plans underway
22 A	I-435/Quivira Interchange to US-69/119th St.		$115	—	
22 B	US-69 from 119th to 103rd		$78	—	
22 C	I-435 from I-35 to Quivira		$51	2	
22 D	NB US-69 CD Rd. from 119th St. to I-435		$100	2	
22 E	119th and US-69 Interchange		$79	1	
22 F	US-69 from 167th St to 119th St		$178	6	
23	**K-16 Modernization** from 3 miles west of Holton to K-116 in Jackson County	Add shoulders	$15	6	
24	**K-31 Modernization** from Osage City to US-75 in Osage County	Add shoulders	$13	7	
25	**K-20 Modernization** from US-75 to Horton in Brown County	Add shoulders	$19	10	
		Total Costs	**$1.4 billion - $3.4 billion**		

MANAGED LANES

Source: TWorks

Kansas Department of Transportation

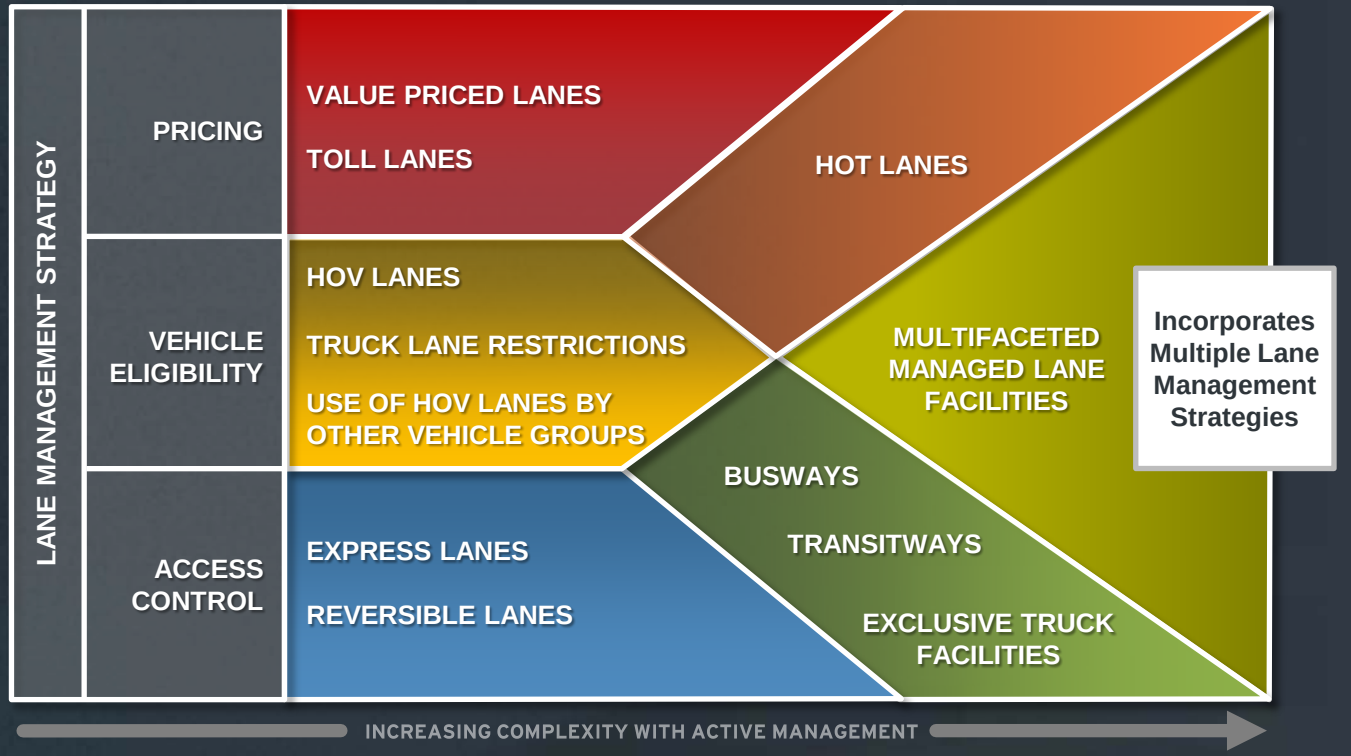
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WHAT ARE MANAGED LANES?

WHAT ARE MANAGED LANES?

Highway facilities or a set of lanes where operational strategies are proactively implemented and managed in response to changing conditions.

http://ops.fhwa.dot.gov/freewaymgmt/managedlanesvideo/index.htm



MANAGED LANES

Source: USDOT, Managed Lanes: A Primer

Kansas Department of Transportation

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WHAT ARE MANAGED LANES?







How do managed lanes benefit a region?

- Trip reliability
- Time savings
- Improved mobility
- Congestion management
- Revenue generation
- Reduction in capital improvements and right of way
- Green lanes

WHAT ARE MANAGED LANES?







What are key issues with managed lanes?

- Three “feasibilities” – technical, institutional, financial
- Conflicting or compatible goals
  - Better management
  - Transit/rideshare promotion
  - Revenue generation
- Safety-speed differential
- Enforcement
- Sponsorship and governance

WHAT ARE MANAGED LANES?







When are managed lanes the right approach?

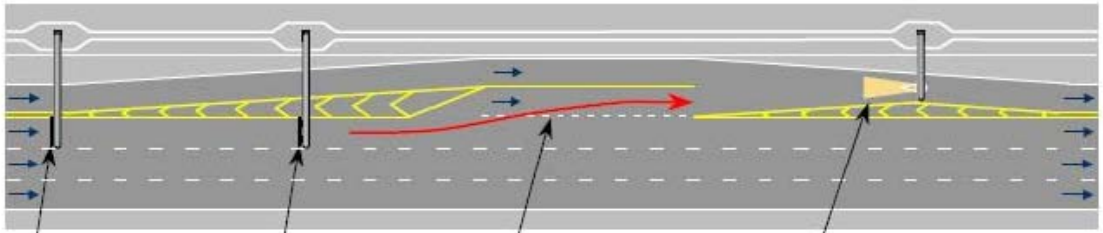
- Improves regional and statewide mobility and safety
- Increases reliability of travel
- Limited right of way to add new capacity
- Want to encourage multimodal use
- Have sufficient public and political support
- Have project consistency with local, regional and state transportation plans
- Need to generate revenue to pay for transportation improvements

WHAT DO MANAGED LANES LOOK LIKE?

HOT lane separation



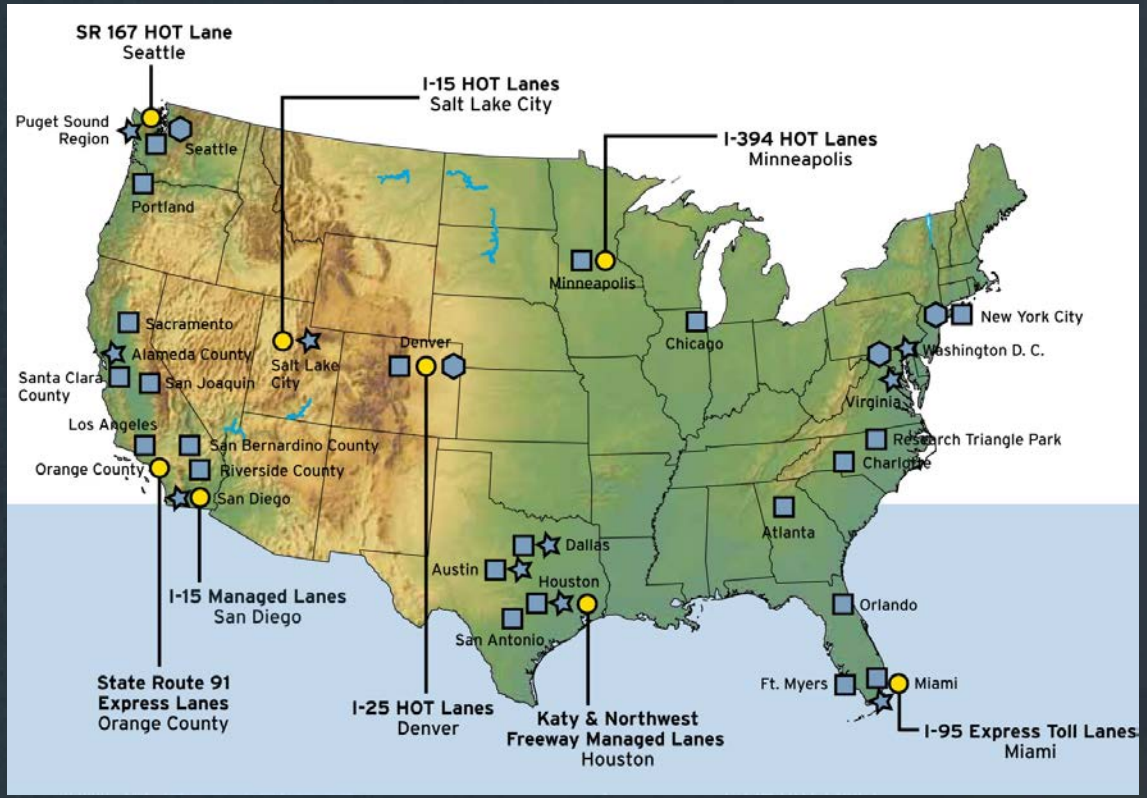
Entrance design
(exits are designed with similar weaving lanes)



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Source: Minnesota Department of Transportation

WHERE ARE MANAGED LANES TODAY?



SR 91 EXPRESS LANES
ORANGE COUNTY, CALIFORNIA



- Opened December 1995 (private franchise)
- Purchased by OCTA January 2003
- 10 miles, two-lanes each direction
- Buffer-separated, access at ends and one intermediate
- Variable toll rates, predetermined rates by time of day ($10.25 max.)
- Operates 24/7

Objectives

- Use pricing to optimize the number of vehicles that can safely travel the toll lanes at free-flow speeds
- Finance the project to accelerate construction

MNPASS I-394
MINNEAPOLIS, MINNESOTA





- Opened May 16, 2005
- Began as HOV, converted to HOT
- 10 miles total, eight miles single lanes, two ½ mile reversible
- Striped buffer, five access locations in each direction
- Dynamic pricing ($8.00 max.), HOV2+ free
- Reversible 6am to 1pm EB, 2pm to 5am and weekends EB
- Tolls 6am to 10am EB, 2pm to 7pm WB

I-15 EXPRESS LANES
UTAH

Objectives

- Introduce tolling to Utah
- Improve use of the HOV lanes (<50% utilization)
- Opened September 1, 2006
- 38 miles, two-lane bi-directional, buffer separated
- Numerous access locations
- Monthly fee, decals issued $50/mo.
- Operates 24/7, manual enforcement
- ETC system debuted August 23, 2013; 6,000 transponders



MANAGED LANES

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WHAT ARE KEY LESSONS LEARNED FROM EXISTING FACILITIES?







- Intense public/media outreach and education needed
- Elected officials outreach/education program
- ETC program publicity
- Must decide on business case: revenue vs. congestion management
- Strong business rules and enforcemetn
- Use a system approach
- Design: signing, access, termini
- Likely not financially self-supporting
- Transit part of the solution, not the whole solution
- Learn from others, talk among peers

WHAT TYPES OF FINANCING ARE AVAILABLE FOR MANAGED LANES?







- Kansas T-WORKS program funding
- Federal pilot programs for managed lanes
- Tolls, fares or other user fees from transportation projects
- Proceeds from the sale or lease of property adjoining a transportation project
- Regional taxes: sales taxes, wheel taxes
- Impact/development fees or rights

FEDERAL PROGRAMS FOR MANAGED LANES







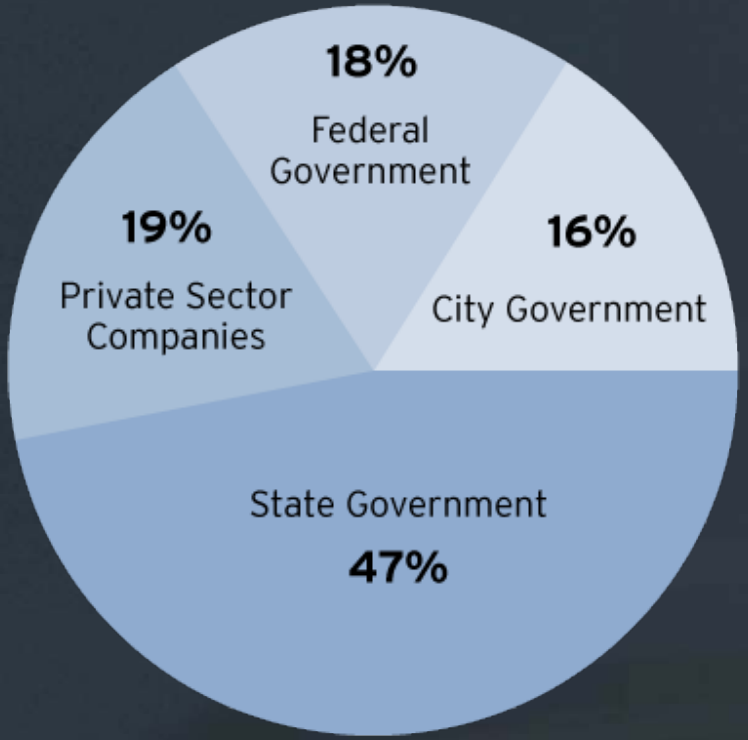
FHWA Office of Operations

- Express lanes demonstration program
- High occupancy vehicle (HOV) facilities
- Value pricing pilot program
- Interstate system construction toll pilot program
- Interstate system reconstruction and rehabilitation program
- Section 129 toll agreements

WHAT IS THE PERCEPTION OF TOLLING TODAY?

Public Perception is Changing

Q. Who do you think best manages and maintains infrastructure projects?



MANAGED LANES

Source: HNTB America THINKS 2010 Tolls Survey

Kansas Department of Transportation

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WHAT IS THE PERCEPTION OF TOLLING TODAY?

Public Opinion on Toll Roads has Shifted

- When asked “free road vs. toll road,” they answer free road
- When asked “toll road vs. no road,” they answer toll road

Key to Public Acceptability

- Credibility of the argument that funding is not available from other sources
- Public perception that use of tolls will bring the project much sooner than waiting for funding from other sources

Source: HNTB America THINKS 2010 Tolls Survey

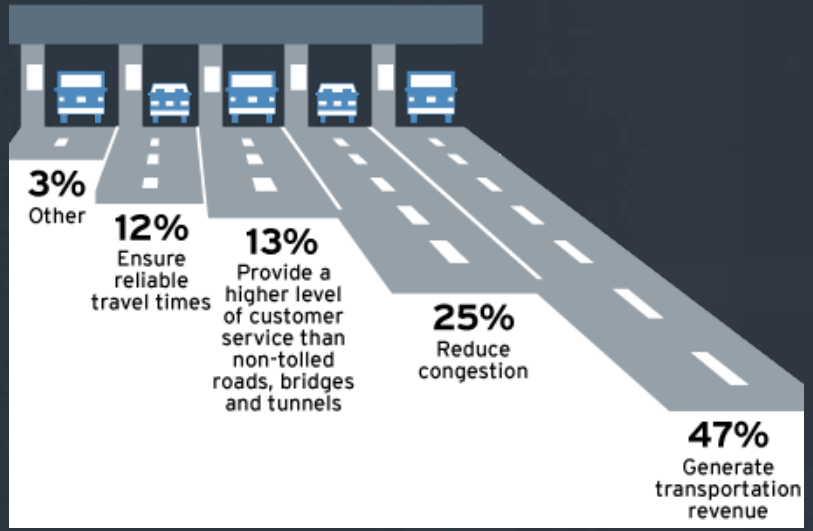
WHAT IS THE PERCEPTION OF TOLLING TODAY?

Tolls Mean Revenue

Nearly half of America say a toll facility's most important purpose is to provide funds for transportation infrastructure.

Q. Which of the following is the most important purpose of a toll facility?

Please think of a "toll facility" as all of the infrastructure associated with a road, bridge or tunnel where drivers pay a fee for its use.



MANAGED LANES

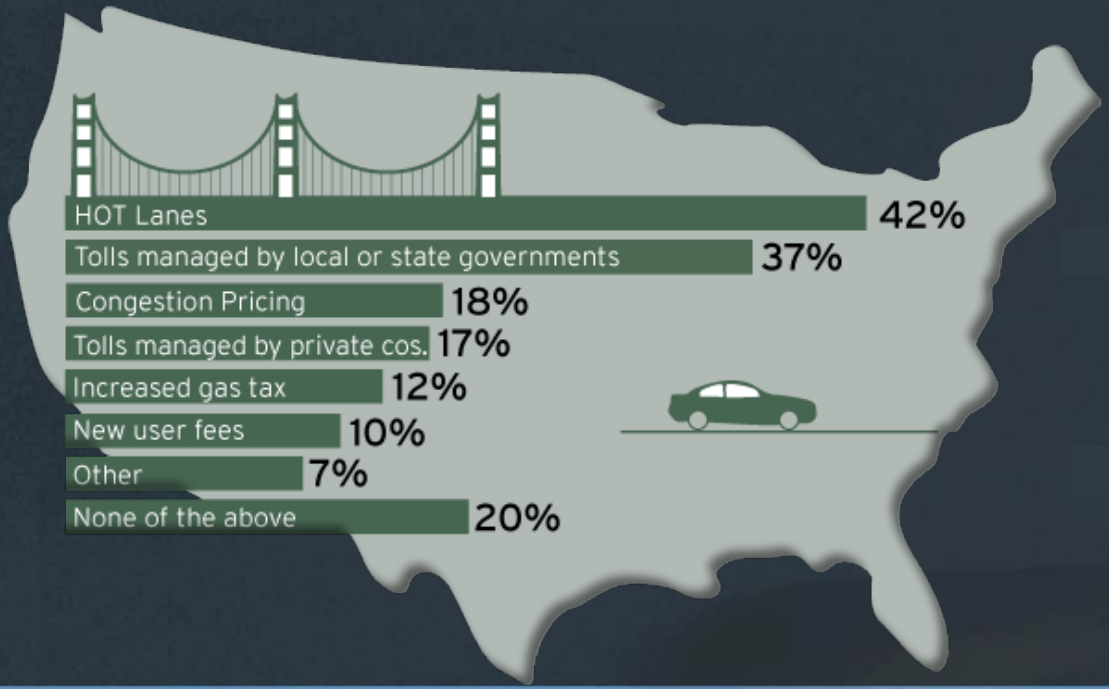
Source: HNTB America THINKS 2010 Tolls Survey

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WHAT IS THE PERCEPTION OF TOLLING TODAY?

Q. How should America pay for roads and bridges in the future?



MANAGED LANES

Source: HNTB America THINKS 2010 Tolls Survey

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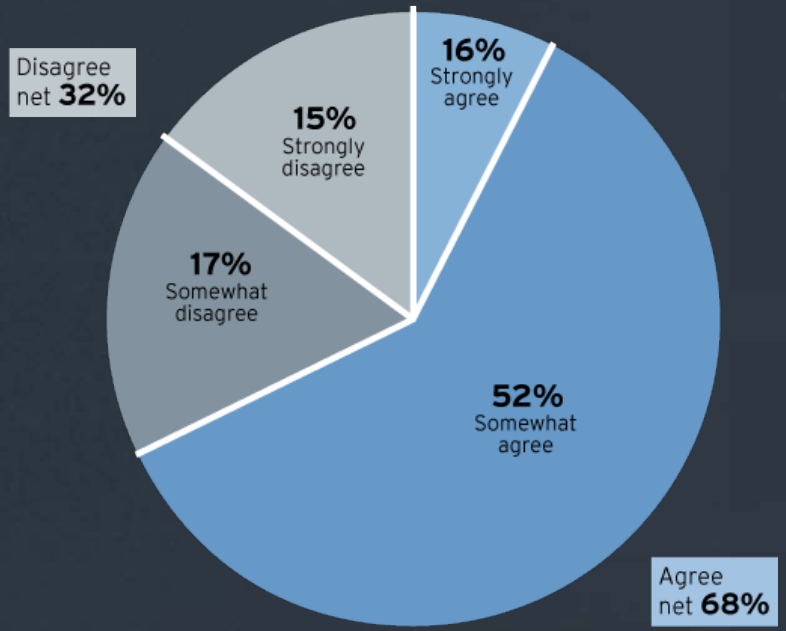
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WHAT IS THE PERCEPTION OF TOLLING TODAY?

Time Savings Raises Tolling's Appeal

More than six in 10 Americans would be willing to pay a higher toll fare if it saves them time.

Q. How strongly do you agree or disagree with the following statement: I would be willing to pay a higher toll fare if it saved me travel time.



MANAGED LANES

Source: HNTB America THINKS 2010 Tolls Survey

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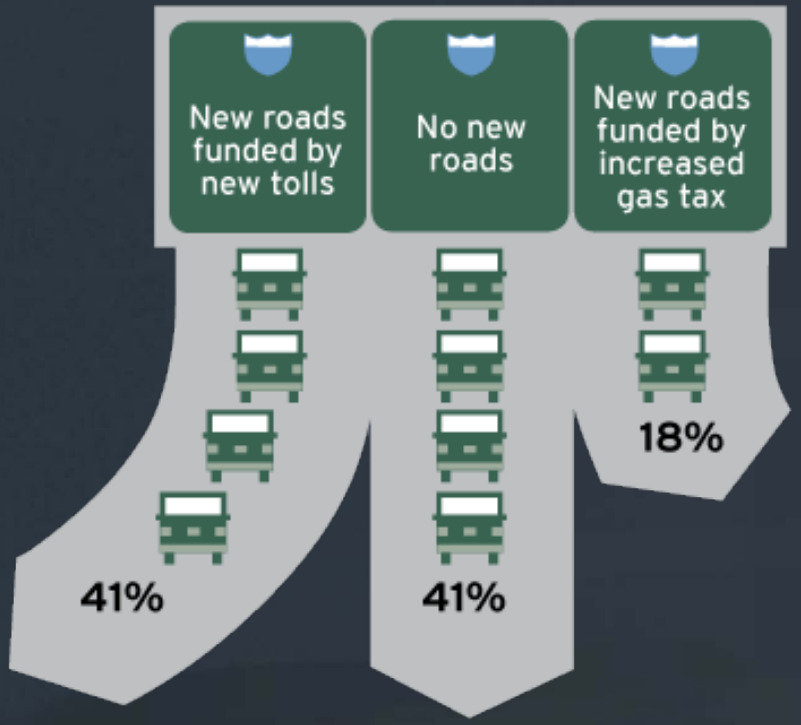
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WHAT IS THE PERCEPTION OF TOLLING TODAY?

Taxes, Tolls or No New Roads

When given a choice, eight in 10 Americans prefer tolls (41 percent) or no new roads at all (41 percent) over increased gas taxes (18 percent).

Q. If you had to select one, which of the following would you prefer?



MANAGED LANES

Source: HNTB America THINKS 2010 Tolls Survey

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HOW DOES A REGION BENEFIT FROM TOLL FINANCING?







- Manages mobility – not just intended to raise money
- Creates a new financial tool to fund regional priorities
- Reduces financial burden on KDOT and regional transportation providers
- Only those who choose to use the tolled facility will be required to pay
- Everyone benefits from reduced congestion
- More gas tax revenue is available to address other transportation needs and to maintain existing roadways
- Ability to use excess toll revenue to meet other mobility needs in the region without raising taxes

WHERE MAY MANAGED LANES MAKE SENSE IN KANSAS?







- System approach
- Urban corridor
  - I-35 Bus on Shoulder
  - I-435/I-35/K-10 Managed Lanes (Johnson County Gateway)
  - I-35 Managed Lane Study
- Rural corridor
  - KTA
  - I-70 Dedicated Truck Lanes

WHAT ARE THE KEY LESSONS LEARNED?







- Be realistic with expectations
- Don’t take any existing capacity away
- Demand is highly discretionary
- Not all corridors are good candidates
- Capital cost recovery through pricing typically requires more than one lane and restricting free use
- Agency partnering is critical
- Competing interests on what managed lanes should do – congestion management vs. revenue generation
- Regional lane systems provide the best opportunities

http://ops.fhwa.dot.gov/freewaymgmt/mngd_lns_hov.htm

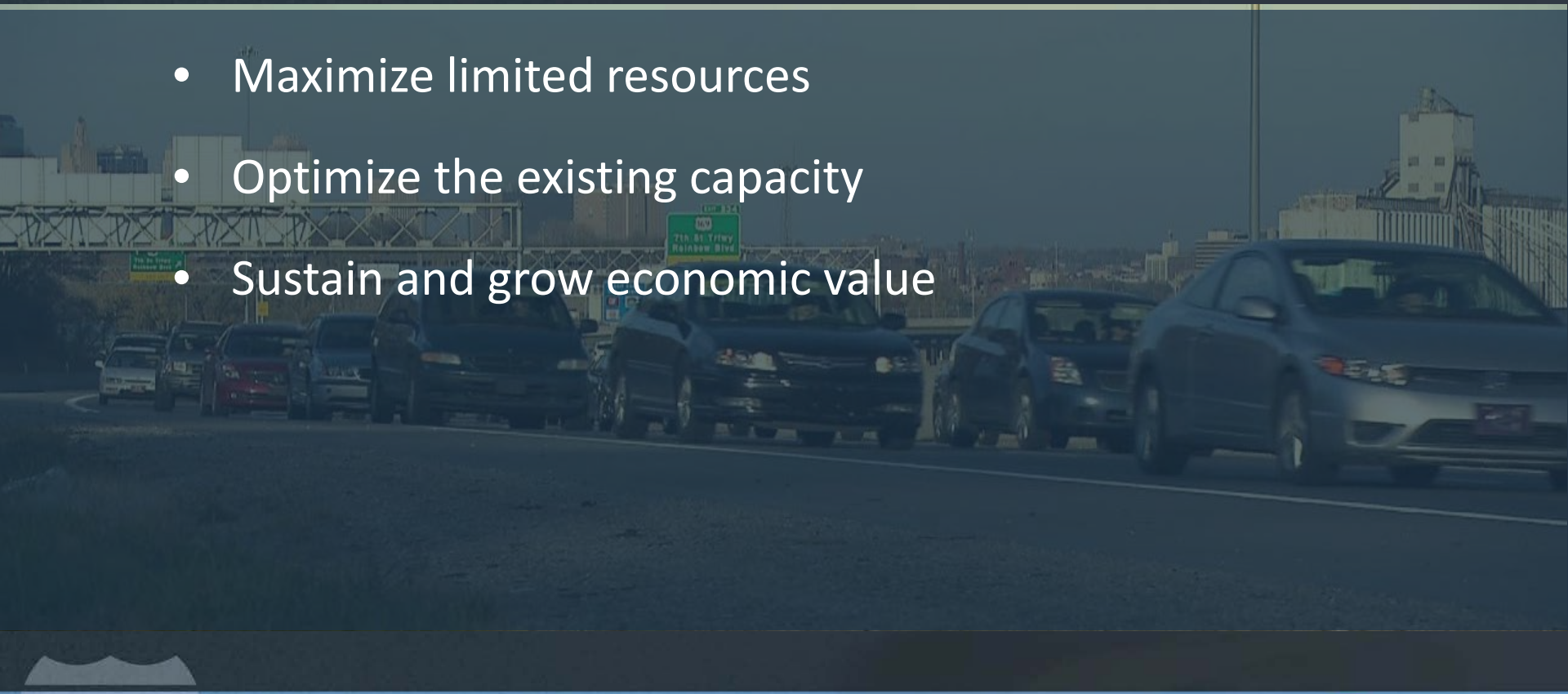
I-35 MANAGED LANES STUDY

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WHY THIS PROJECT IS IMPORTANT



- Maximize limited resources
- Optimize the existing capacity
- Sustain and grow economic value

WORKFLOW

Phase 1: Problem Definition



PHASE 1

Problem Definition
I-35, U.S. 69, I-435, K-10

- Goal Setting
- Previous Studies
- Understanding Travel Characteristics
- Existing and Future No-Improvement
- Advisory Group

PHASE 2

I-35 Future Strategies
(Short Term and Long Term)

- Universe of Initial Strategies
- Practical Strategies
- Analyze Strategies
- Strategy Packages
- Advisory Group
- Focus Groups
- Advisory Group
- National Experts Best Practices

PHASE 3

I-35 Optimization Plan

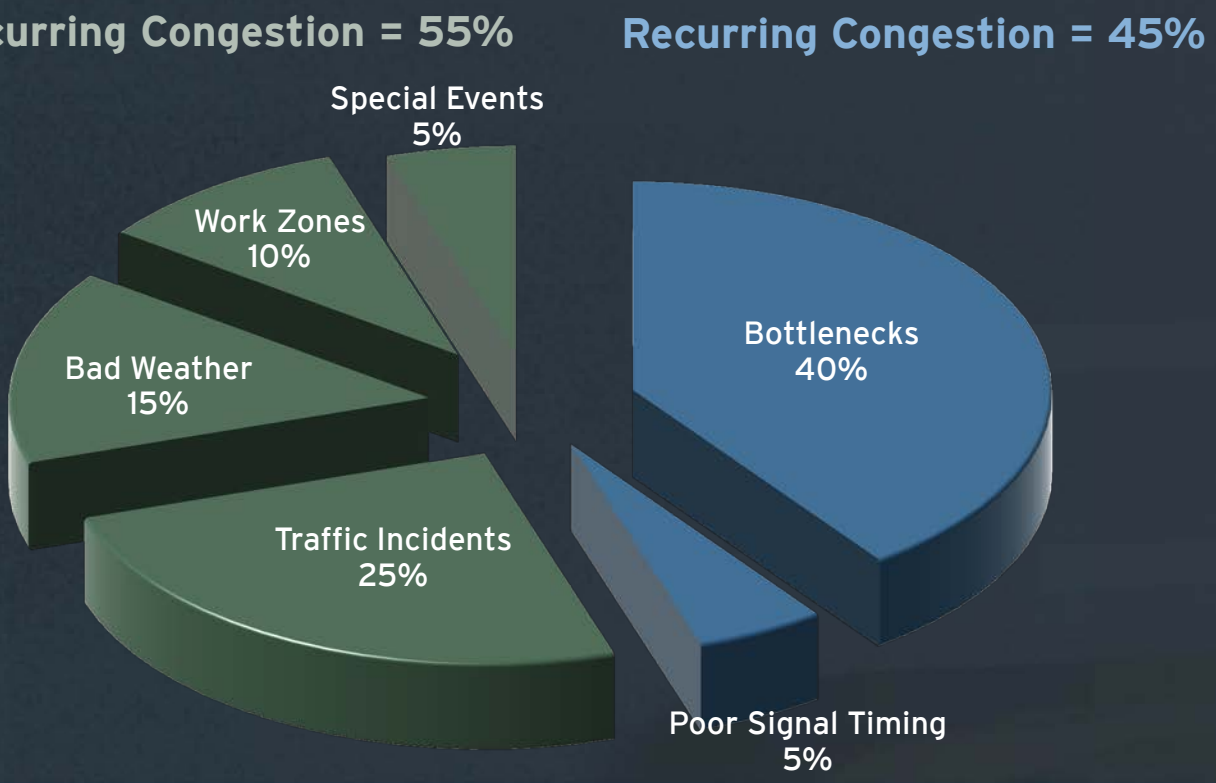
- TREDIS
- Preferred Strategies
- Triggers Plan
- Public Roll-out
- Implementation Plan
- Evaluate Public Education Needs
- Advisory Group

MANAGED LANES

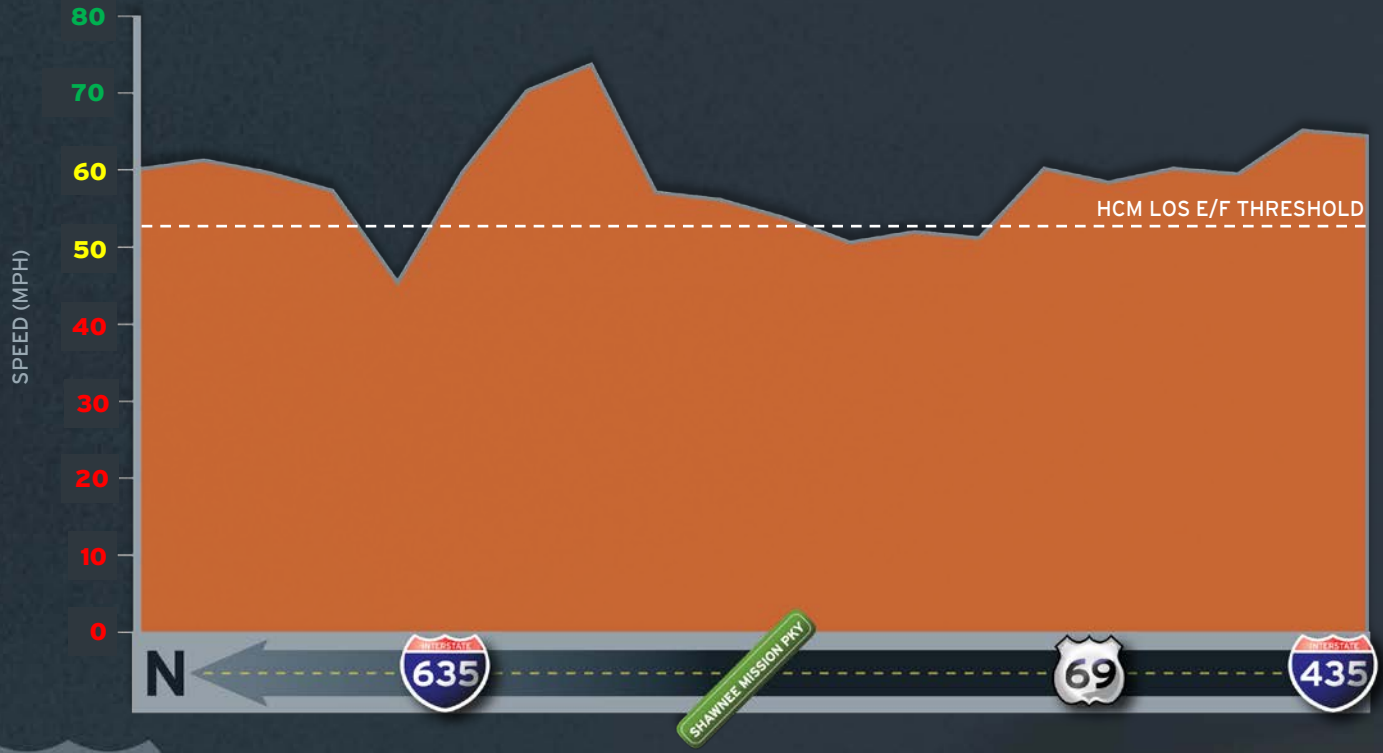
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INTERSTATE CONGESTION



I-35 CONGESTION





4:00-4:15

PM Rush Hour (SB)

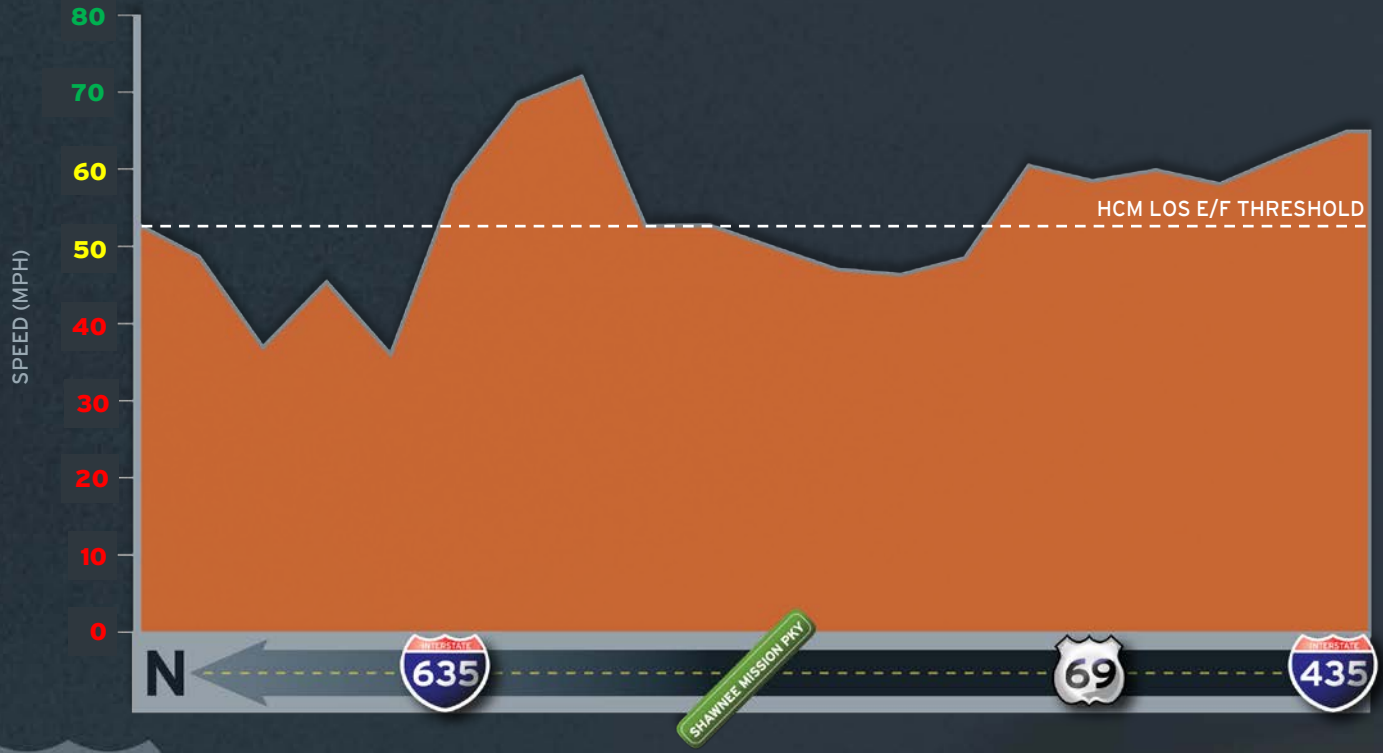
10 Days - SCOUT Data

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I-35 CONGESTION





4:15-4:30

PM Rush Hour (SB)

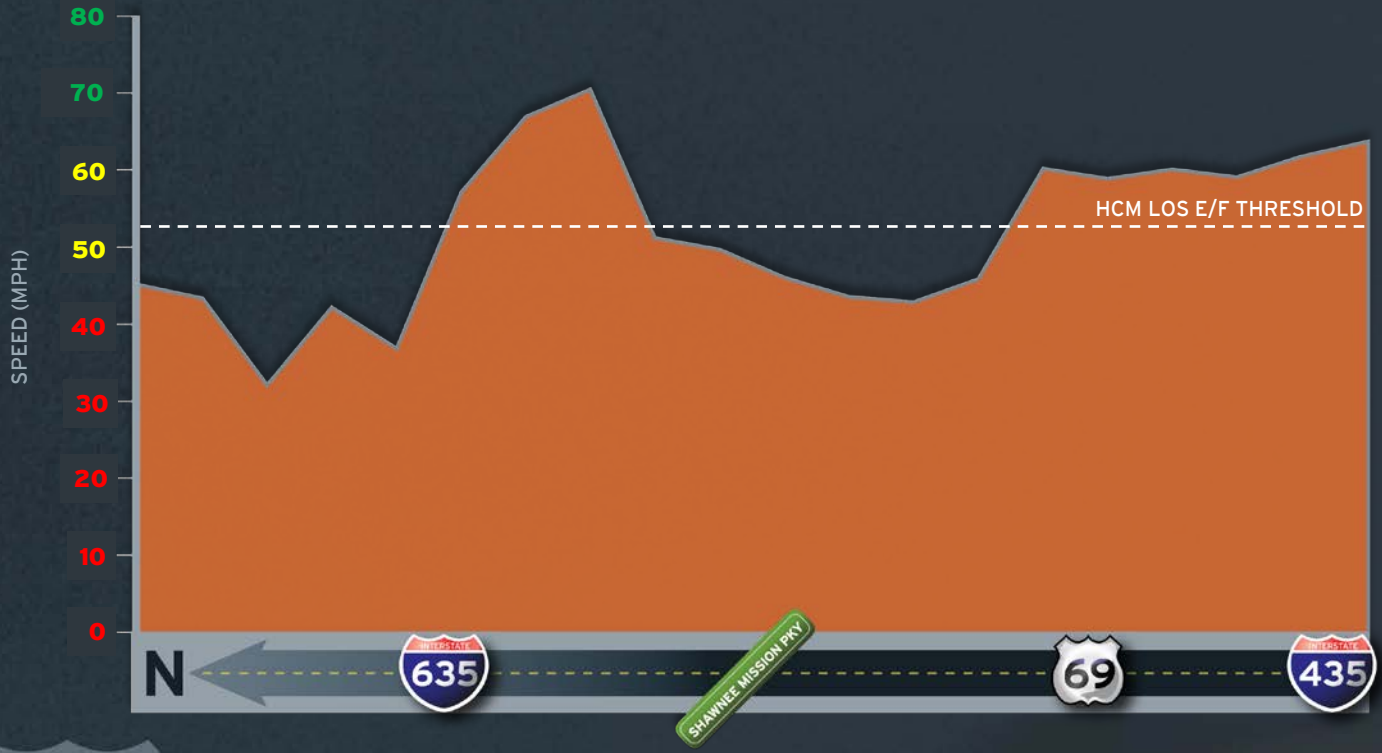
10 Days - SCOUT Data

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I-35 CONGESTION





4:30-4:45

PM Rush Hour (SB)

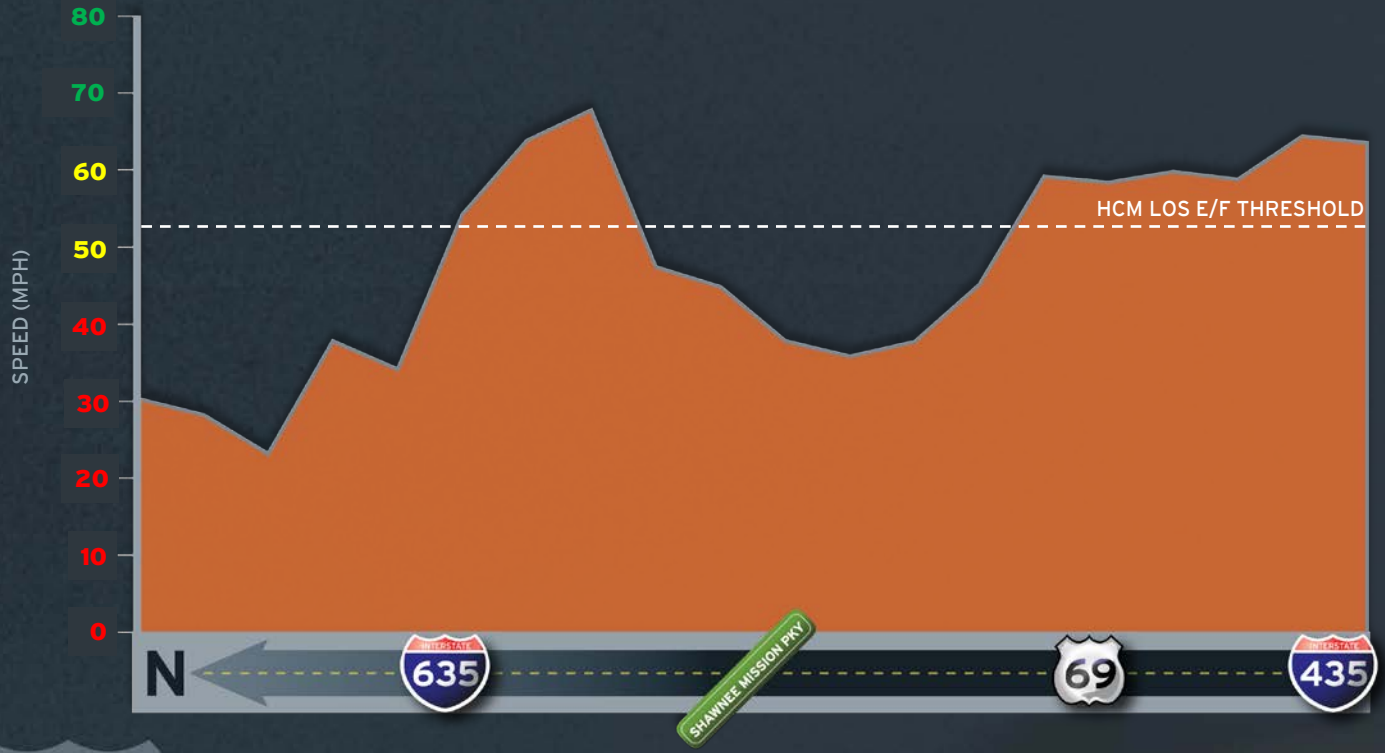
10 Days - SCOUT Data

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I-35 CONGESTION





4:45-5:00

PM Rush Hour (SB)

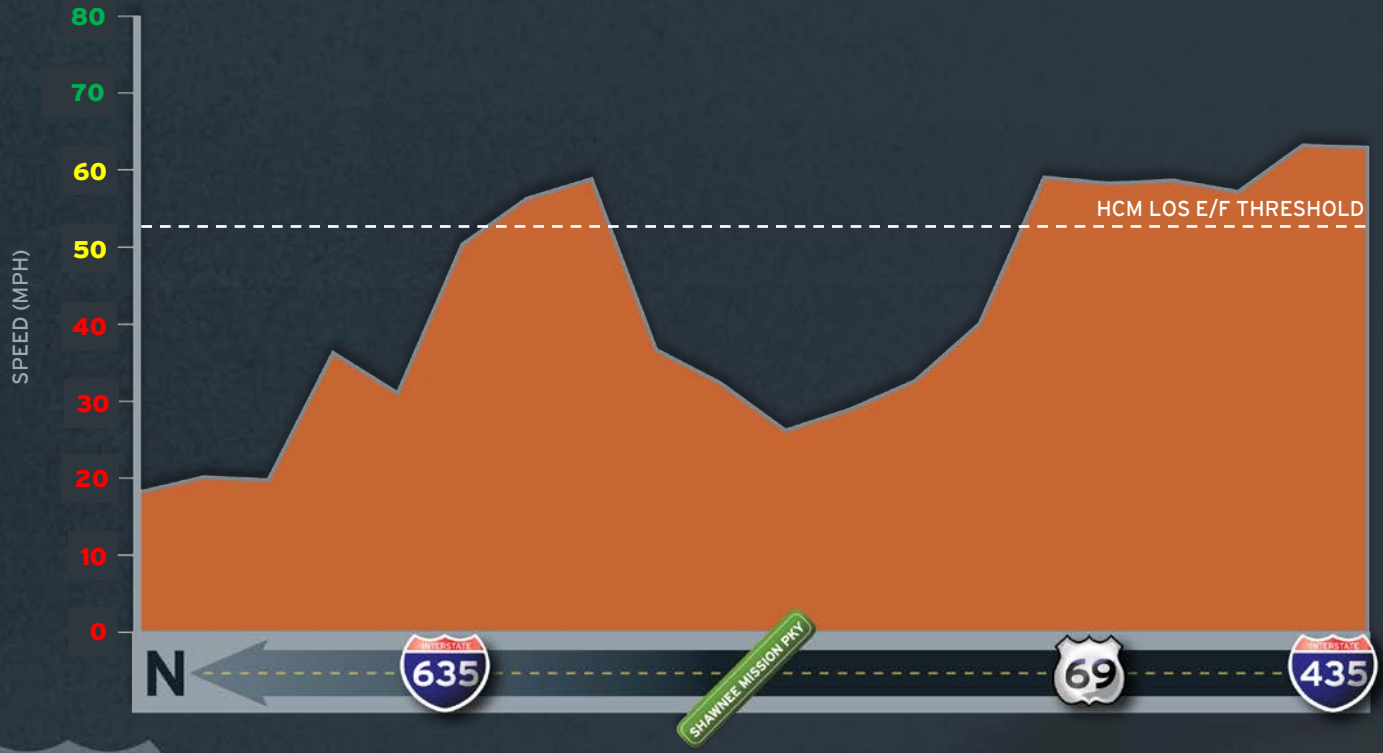
10 Days - SCOUT Data

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I-35 CONGESTION





5:15-5:30

PM Rush Hour (SB)

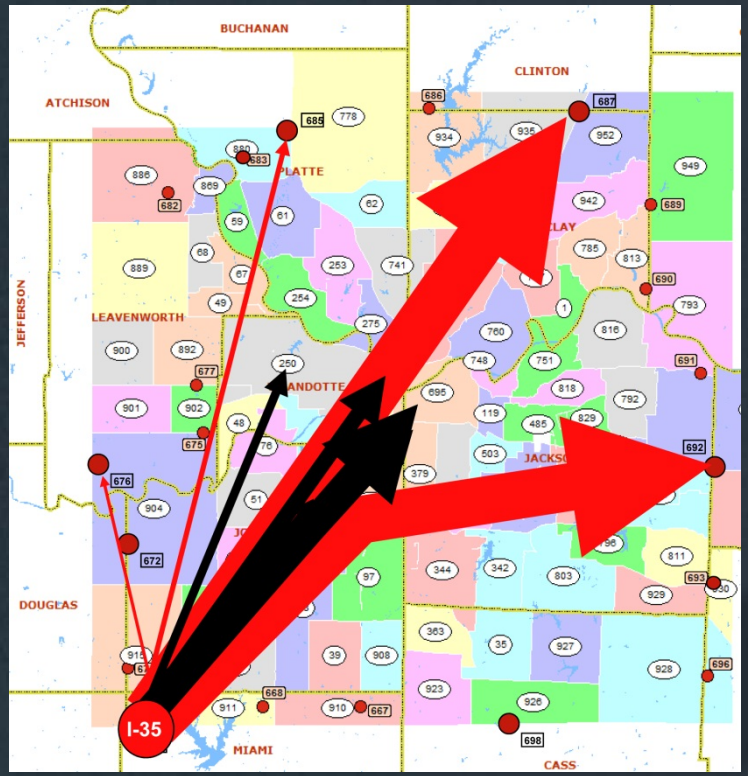
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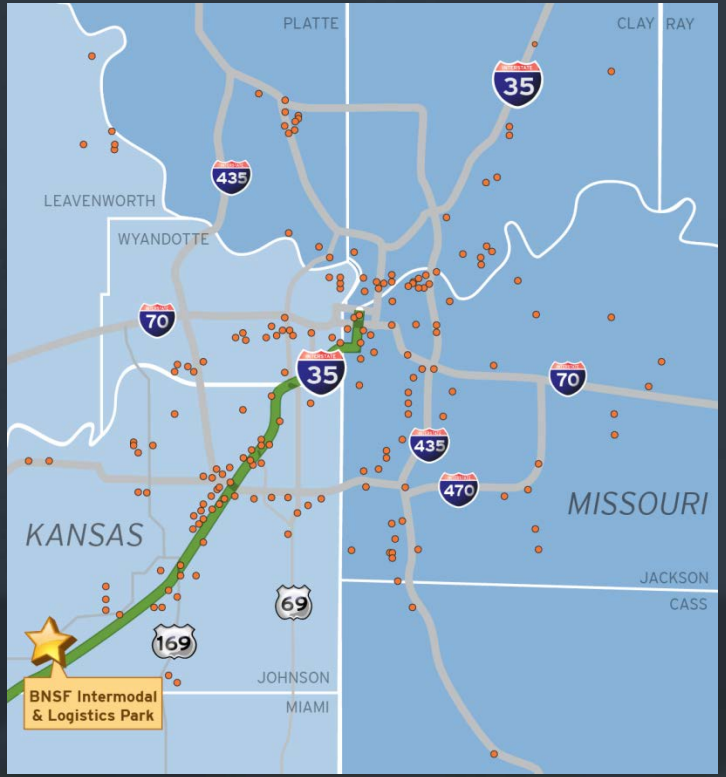
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I-35 TRUCK MOVEMENTS





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I-35 IMPROVEMENTS

- I-35 travel characteristics
- Constraints for adding a NB and SB lane
- 2012/2013 improvements
  - ITS expansion
  - Bus on shoulder is an initial managed lane
  - Gateway Yellow Project
  - Homestead Lane Interchange



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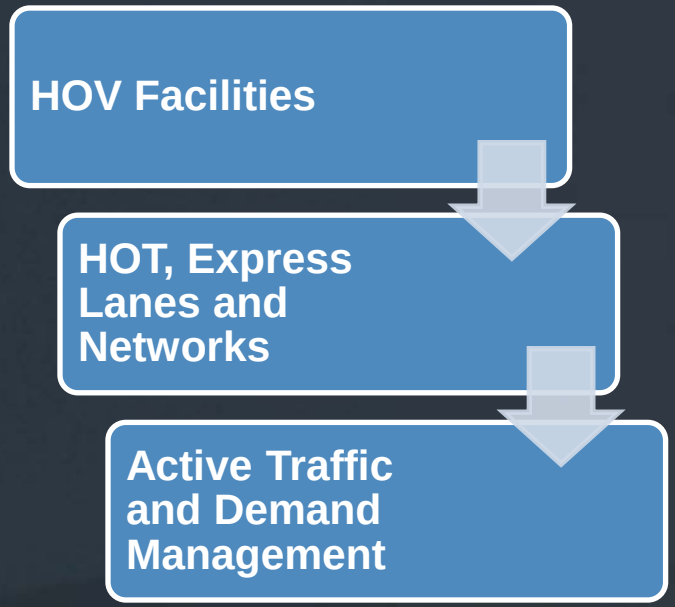
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STATE OF THE INDUSTRY OVERVIEW

National Trends

- Managed Lanes - a broad term for a variety of lane management strategies
- Corridor development programs that incorporate multiple strategies

Evolution of Managed Lanes



STATE OF THE INDUSTRY OVERVIEW

International Trends

- Two international scan tours by FHWA, AASHTO and NCHRP
- Proactive management through integration of demand and supply-influencing strategies
- Applications targeted at
  - High volume corridors with reliability issues
  - High collision locations
  - Corridors with limitations to expansion



UNIVERSE OF STRATEGIES



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DETERMINING PRACTICAL STRATEGIES

Universe of Strategies

Strategy	Screening Criteria: Safety	Congestion	Freight	Economic Impact	System Preservation/ Sustainability	Stakeholder Support	Project Cost
Strategy 1: No Action	—	—	—	—	—	—	$
Strategy 2: General Capacity	◑	◑	◑	◑	◑	—	$$$$
Optimization Strategy 3	●	●	◑	◑	◑	●	$$$
Optimization Strategy 4	◔	—	—	—	○	●	$$
Optimization Strategy 5	●	◔	◔	◔	◔	◑	$

Legend

- ● High (Excellent)
- ◔ Medium (Good)
- ◑ Low (Fair)
- — No Change
- ○ No Benefits (Poor)

ANALYZING PRACTICAL STRATEGIES

By I-35 Section and Time Period

Practical and Supportable Strategies

Measures of Effectiveness						
Strategy	Incident Reduction	Hourly Person Throughput	Freight Productivity	Stakeholder Support	Annual Revenue Potential	Project Cost
Strategy 1: No Action	–	–	–	–	–	$10M
Strategy 2: General Capacity	5%	13,200	High	Yes	$0	$50M
Optimization Strategy 3	7%	14,000	Medium	No	$1M	$10M
Optimization Strategy 4	10%	12,000	Low	Yes	$2M	$20M
Optimization Strategy 5	None	14,000	High	No	$0	$50M

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TRAFFIC FORECAST METHODOLOGY

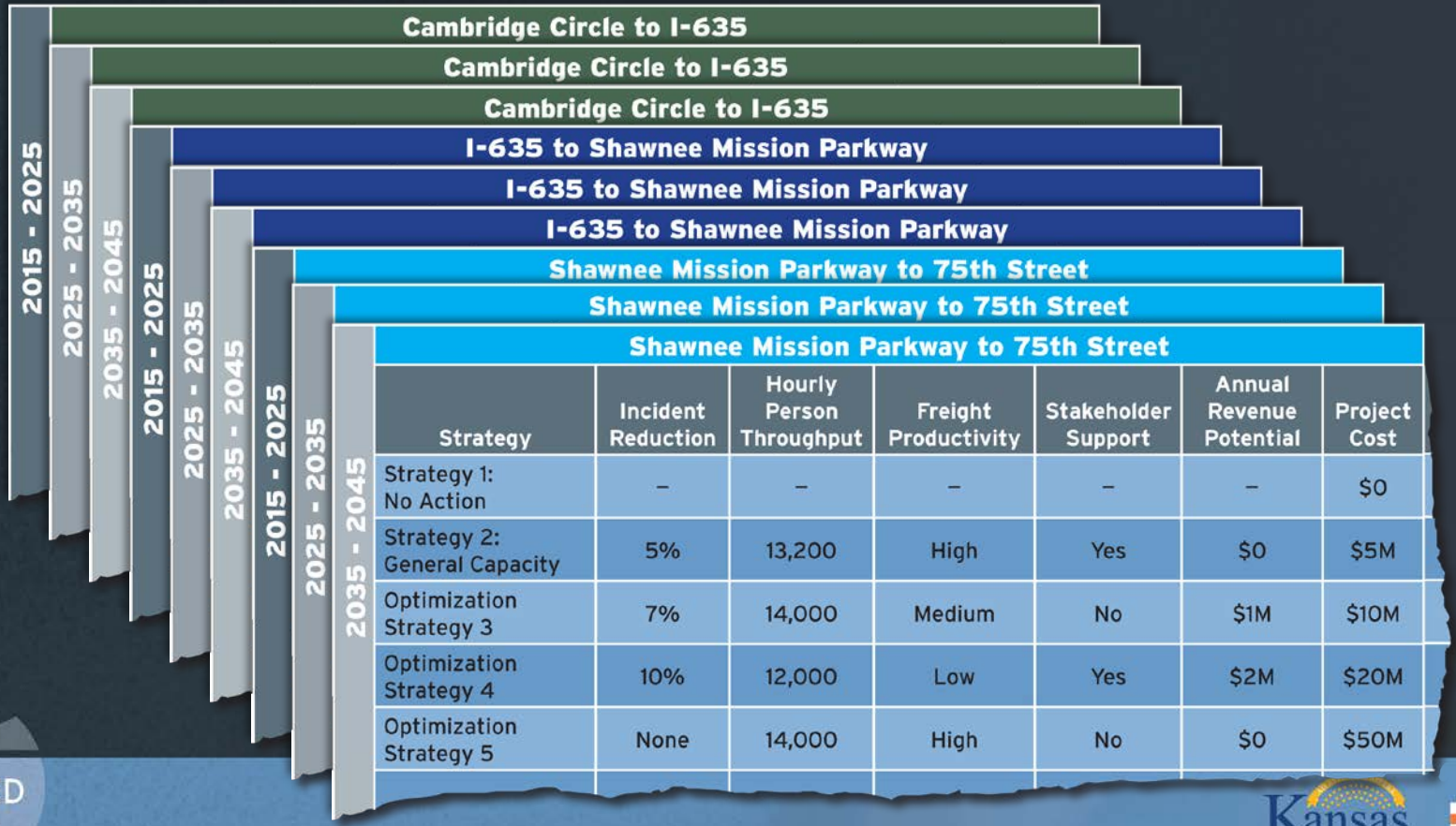
- Pricing options
  - Time of day
  - Day of week
  - Occupancy-based
  - Vehicle type
- Payment options
  - Traditional
  - AVI/Cash
  - ORT/Cashless



Results Matrix

Practical and Supportable Strategies	Strategy	Measures of Effectiveness: Incident Reduction	Hourly Person Throughput	Freight Productivity	Stakeholder Support	Annual Revenue Potential	Project Cost
	Strategy 1: No Action	–	–	–	–	–	$10M
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DEVELOP STRATEGY PACKAGES Based on Time and Corridor Location



Strategy	Incident Reduction	Hourly Person Throughput	Freight Productivity	Stakeholder Support	Annual Revenue Potential	Project Cost
Strategy 1: No Action	–	–	–	–	–	$0
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Optimization Strategy 4	10%	12,000	Low	Yes	$2M	$20M
Optimization Strategy 5	None	14,000	High	No	$0	$50M

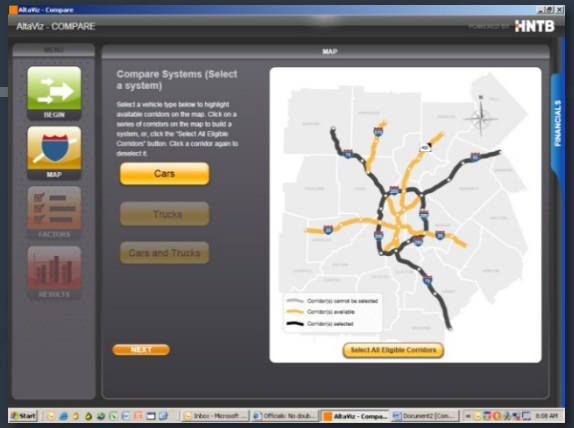
MANAGED LANES

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ALTAVIZ™ Atlanta Managed Lane Study







MANAGED LANES

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I-35 OPTIMIZATION PLAN

- Optimization packages - what, where, and when
- Triggers - when needed and how long
- Cost
- FHWA funding opportunities
- TREDIS
- Implementation Plan
  - Tied to I-35 goals
  - Public roll-out
  - Approach for other Kansas corridors



I-35 BUS ON SHOULDER MANAGED LANE

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I-35 BUS ON SHOULDER



BACKGROUND

- I-35 is a main regional artery
- Traffic volumes increasing on I-35 and it is approaching capacity
- I-35 is a viable transit corridor for the region
- Johnson County Transit is improving service along I-35 with additional and enhanced stops
- There are additional opportunities to enhance transit in this area
- Widening I-35 is difficult because of ROW needs and cost



INNOVATION

- Bus on Shoulder (BOS) is an innovative way to move more people on the existing I-35
- Used in Minneapolis, Miami/Dade County, Chicago and Washington, DC
- Uses existing infrastructure
- Legislative approval received



- Provides enhanced transportation options
- Improves air quality
- Reliable and efficient because buses run on schedule regardless of congestion

NUMBERS TO KNOW

As we get started talking about the BOS operations, there are a few dates and numbers to know:

- Service started in January 2012
- Eight to 10 buses a day will have the potential to use the shoulders
- Training for drivers occurred December 1st through 8th

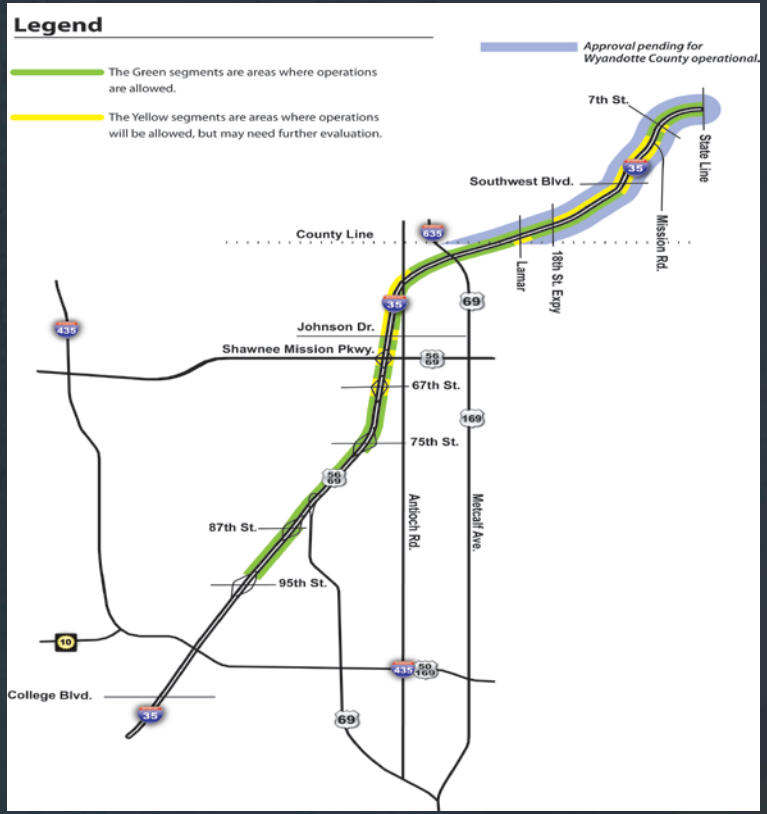
TRAFFIC ANALYSIS

- Existing and future traffic analyzed in cooperation with KDOT
  - Service vs. system interchange operations
  - BOS has no negative effect on existing traffic
  - VISSIM model
- Benefits
  - Time savings on “normal” days (three to five minutes)
  - Greater opportunity for travel time savings when there are incidents or inclement weather

OPERATIONAL GUIDELINES

- Uses shoulders during peak periods when traffic is slower than 35 mph
- Buses using shoulders do not travel more than 35 mph
- Buses do not travel more than 10 mph above traffic
- Buses must yield to any vehicle entering, merging or exiting through the shoulder
- Buses must re-enter the main line where the shoulder is obstructed (vehicle debris, incident, etc.)

WHERE WILL BUS ON SHOULDER BE IMPLEMENTED?



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TRAFFIC – HOW IT WORKS



Minneapolis – Bus on Shoulder



TRAFFIC – HOW IT WORKS



Minneapolis – Merge to Mainline



TRAFFIC – HOW IT WORKS



Minneapolis – Stalled Car



TRAFFIC – HOW IT WORKS



Minneapolis – Transition Through Off-Ramp



TRAFFIC – HOW IT WORKS



I-35 Bus on Shoulder - Implemented



SAFETY

- Bus drivers are trained professional drivers
  - Accountable to the operating rules
  - Able to handle more complex driving decisions
- Buses are easily seen by other motorists
- Shoulder use is limited to a small number of vehicles
- Speeds are low

SAFETY – PUBLIC EDUCATION



Objective and Goal

- Educate public about Bus on Shoulder operations and benefits



Key Audiences

- Highway users
- Commuters
- Bus users
- Community leaders
- Law enforcement
- Special interest groups

SHOULDER CRITERIA AND CONSIDERATIONS



I-35 Bus on Shoulder evaluation technical memo and numerous meetings identified:

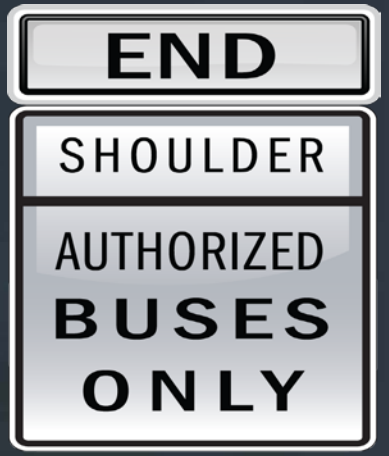
- Typical signing
- Shoulder width
- Shoulder depth
- Rumble strips and inlets
- Interchanges
- Limiting bus movement

BUS ON SHOULDER TYPICAL SIGNING

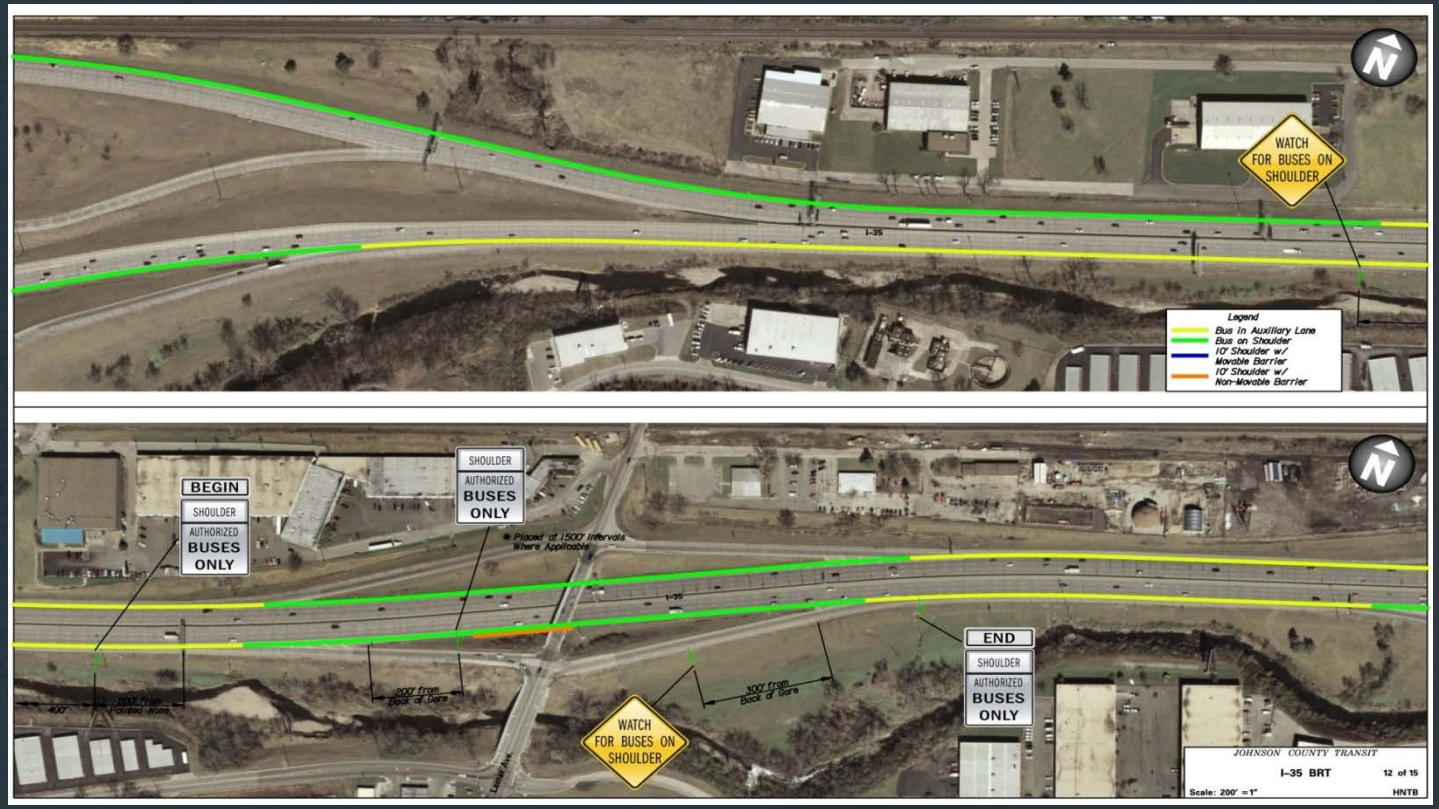








BOS TYPICAL SIGNING PLAN



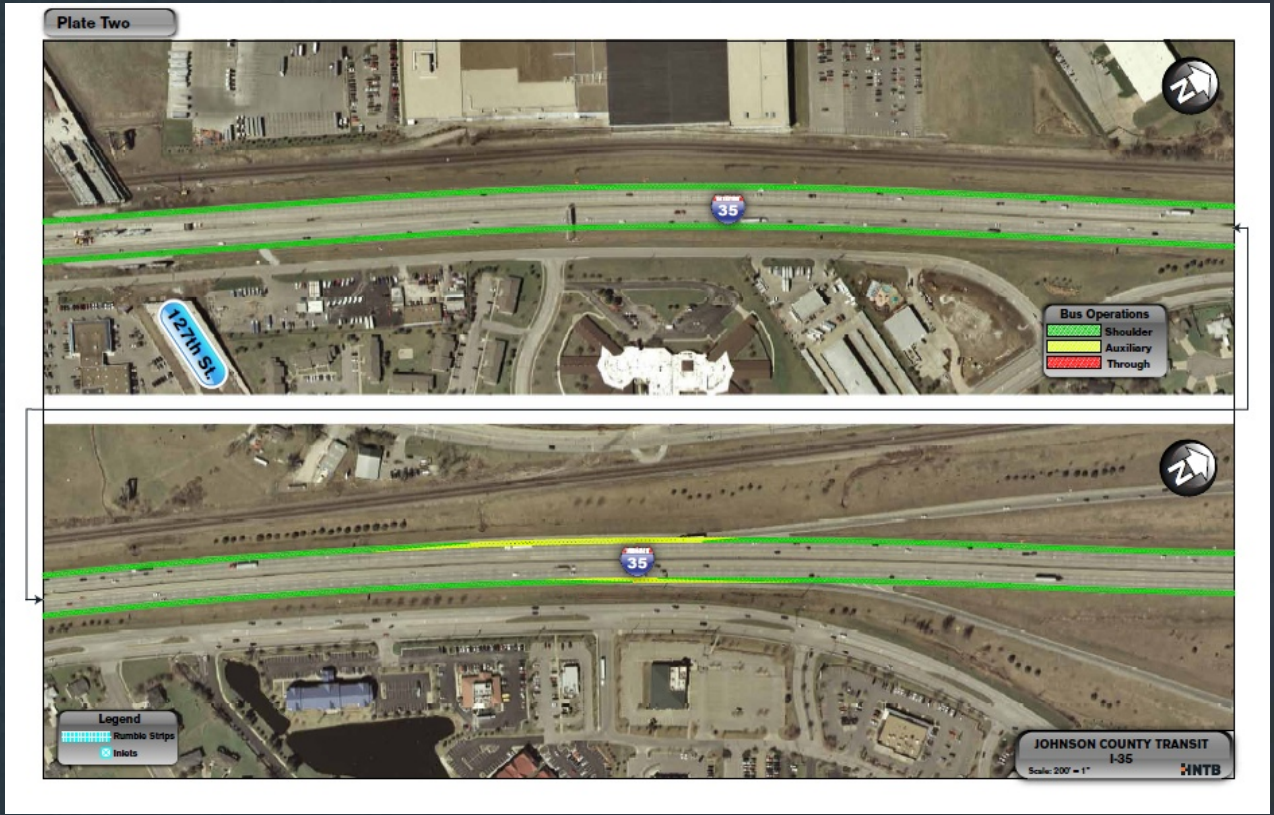
ENFORCEMENT ISSUES

- Potential copy cat drivers
- Jealous motorists
- Timely removal of vehicles left on shoulder
- Incident management
- Bus driver violations

MAINTENANCE ISSUES

- Snow removal
- Debris removal
- Storm drain
- Pavement markings

I-35 SHOULDER EVALUATION



I-35 SHOULDER EVALUATION



QUESTIONS?

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