MITIGATING LARGE TRUCK INVOLVEMENT IN CRASHES

A RECAP OF SOME TEXAS EFFORTS…

Robert Brydia

Texas A&M Transportation Institute

Texas A&M Transportation Institute

AGENDA

Why Do We Do This?

Work Zone Traveler Information

End of Queue

Texas Connected Freight Corridors


C.R.England
GLOBAL TRANSPORTATION

ITS IN WORK ZONES

- Work zones create congested conditions
- Often unexpected (mid-day, night)
- Coincides with high truck travel
- Apply ITS to mitigate work zone crashes
- Has evolved significantly in recent years
  - Reliability
  - Capability

WORK ZONE ITS GOAL

- Provide the right information
  - to the right people
  - at the right time
  - to improve driving decisions, behaviors, and outcomes
- The challenge is proper application to meet user needs

SAMPLE ITS WZ APPLICATIONS

- Speed management
- Travel information (en-route / pre-trip)
- Over height detection
- Automated ingress/egress warnings
- Intrusion alarms
- End-of-queue warning systems
- Dynamic lane merge
- Variable speed limit
- Ramp metering

KEY IMPLEMENTATION ITEMS

- Define the key question(s)
- Determine stakeholders
- Identify user needs
- Identify potential solutions
- Understand operational scenarios
- Track performance

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I-35 CHALLENGES

1	2	3	4	5
rural corridor	closure locations change nightly	limited space for queue equipment	corridor used by large trucks	potentially severe incidents

- "What are traffic conditions like now?"
- "What will traffic conditions be like on any portion of my drive?"
- "Where might I be delayed by work zone lane closures?"

FHWA CONNECTED WORK ZONE PROJECT

- Regional carrier
  - Receives information via email alerts
  - Closures (with impacts), incidents, delays

- National carrier
  - Specialized web site
  - Freight solver

REGIONAL CARRIER

LISTING COVERS 7AM FRIDAY, NOVEMBER 24 THROUGH 7AM FRIDAY, DECEMBER 1

This listing is subject to change due to inclement weather or other unforeseen events that may occur.

NB NORTHBOUND SB SOUTHBOUND CR CROSS ROAD HIGH IMPACT CLOSURE

HILLSBORO THRU WAXAHACHIE (I-35E)

	DATES/TIMES	LOCATION	ROADWAY	CLOSED	MAP
NB	11/27 - 11/28, 9PM - 6AM	I-35 at US-287, Waxahachie	I-35 E Mainlanes (MM 402.0)	All lanes closed	LINK

DELAY	7PM	8PM	9PM	10PM	11PM	12AM	1AM	2AM	3AM	4AM	5AM	6AM
11/27										10	15	15

	DATES/TIMES	LOCATION	ROADWAY	CLOSED	MAP
NB	11/28 - 11/29, 9PM - 6AM	I-35 at US-287, Waxahachie	I-35 E Mainlanes (MM 402.0)	All lanes closed	LINK

DELAY	7PM	8PM	9PM	10PM	11PM	12AM	1AM	2AM	3AM	4AM	5AM	6AM
11/28			5	5	5					10	15	15

	DATES/TIMES	LOCATION	ROADWAY	CLOSED	MAP
NB	11/29 - 11/30, 9PM - 6AM	I-35 at US-287, Waxahachie	I-35 E Mainlanes (MM 402.0)	All lanes closed	LINK

DELAY	7PM	8PM	9PM	10PM	11PM	12AM	1AM	2AM	3AM	4AM	5AM	6AM
11/29			10	15	10					5	10	10

	DATES/TIMES	LOCATION	ROADWAY	CLOSED	MAP
NB	11/30 - 12/1, 9PM - 6AM	I-35 at US-287, Waxahachie	I-35 E Mainlanes (MM 402.0)	All lanes closed	LINK

DELAY	7PM	8PM	9PM	10PM	11PM	12AM	1AM	2AM	3AM	4AM	5AM	6AM
11/30			5									

SB	Current Delay as of 3:30 PM	NB
0 min	Hillsboro (MM 368) to Waco (MM 334)	0 min
75 min	Waco (MM 334) to Temple (MM 301)	5 min
0 min	Temple (MM 301) to Salado (MM 279)	5 min

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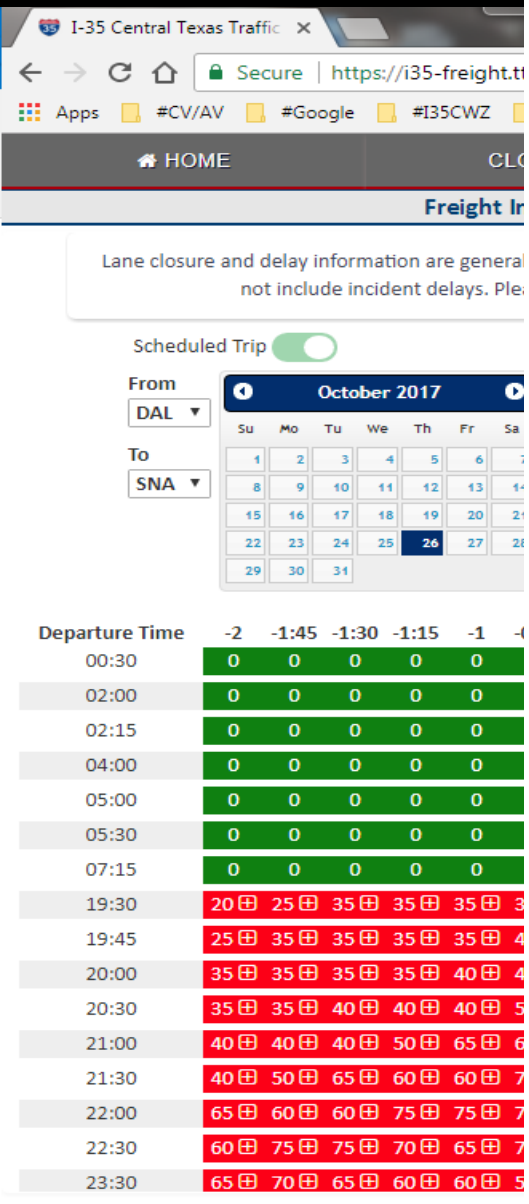


Lane closure and delay information are generally available for the next 7 days and may change frequently. Trip times do not include incident delays. Please consider all information sources in your trip planning.

Departure Time	-2	-1:45	-1:30	-1:15	-1	-0:45	-0:30	-0:15	0	+0:15	+0:30	+0:45	+1	+1:15	+1:30	+1:45	+2
00:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
02:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
04:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
05:30	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
07:15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19:30	20	25	35	35	35	35	40	40	40	50	65	60	60	75	75	70	65
19:45	25	35	35	35	35	40	40	40	50	65	60	60	75	75	70	65	70
20:00	35	35	35	35	40	40	40	50	65	60	60	75	75	70	65	70	65
20:30	35	35	40	40	40	50	65	60	60	75	75	70	65	70	65	60	60

Closures

Expected Delay: 10 min -- Sterrett Rd to FM 387, Waxahachie: 10/26/2017 8:00:00 PM - 10/27/2017 6:00:00 AM, MM 407.5 - 405.0, Asphalt paving.

Expected Delay: 30 min -- I-35 E At US-287, Waxahachie: 10/26/2017 8:00:00 PM - 10/27/2017 6:00:00 AM, MM 404.7 - 403.3, Relocating traffic barrier.

Expected Delay: 10 min -- Brookside Rd to Cantrell, Waxahachie: 10/26/2017 8:00:00 PM - 10/27/2017 6:00:00 AM, MM 402.5 - 398.0, Placing traffic barrier.

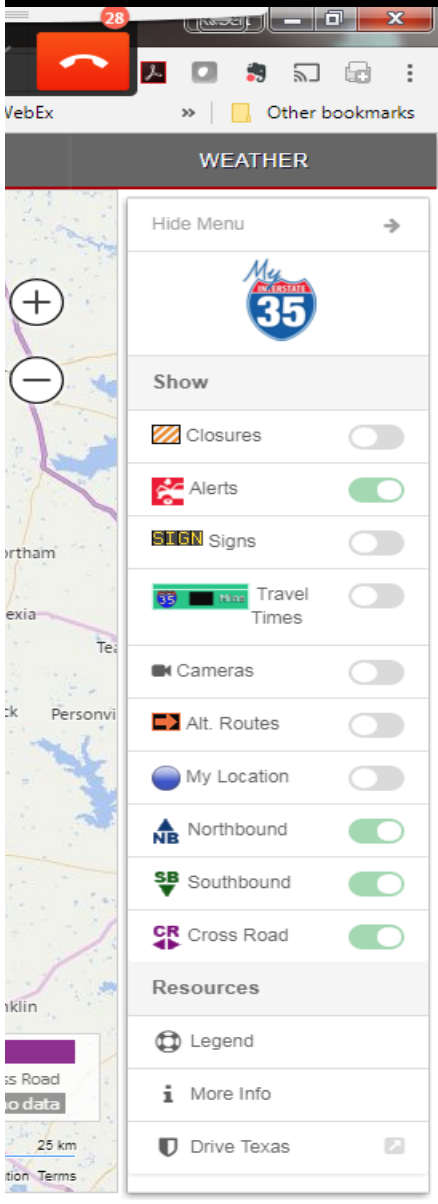
Expected Delay: 0 min -- Pecan Tree Rd to Pecan, Waxahachie: 10/26/2017 6:00:00 PM - 10/27/2017 7:00:00 AM, MM 397.3 - 391.0, Pavement striping.

Expected Delay: 0 min -- Derr's Chapel Rd to FM 934 (35E), Italy: 10/26/2017 6:00:00 PM - 10/27/2017 7:00:00 AM, MM 384.0 - 379.0, Pavement striping.

Expected Delay: 0 min -- FM 308 to FM 566, Milford: 10/26/2017 6:00:00 PM - 10/27/2017 7:00:00 AM, MM 382.0 - 378.0, Removing traffic barrier.

Expected Delay: 30 min -- Private Dr. to Hart/Berger Rd, North of Temple: 10/26/2017 7:00:00 PM - 10/27/2017 6:00:00 AM, MM 306.0 - 305.0, Asphalt Paving.

21:00	40	40	40	50	65	60	60	75	75	70	65	70	65	60	60	50	50



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Why Do We Do This?

Work Zone Traveler Information

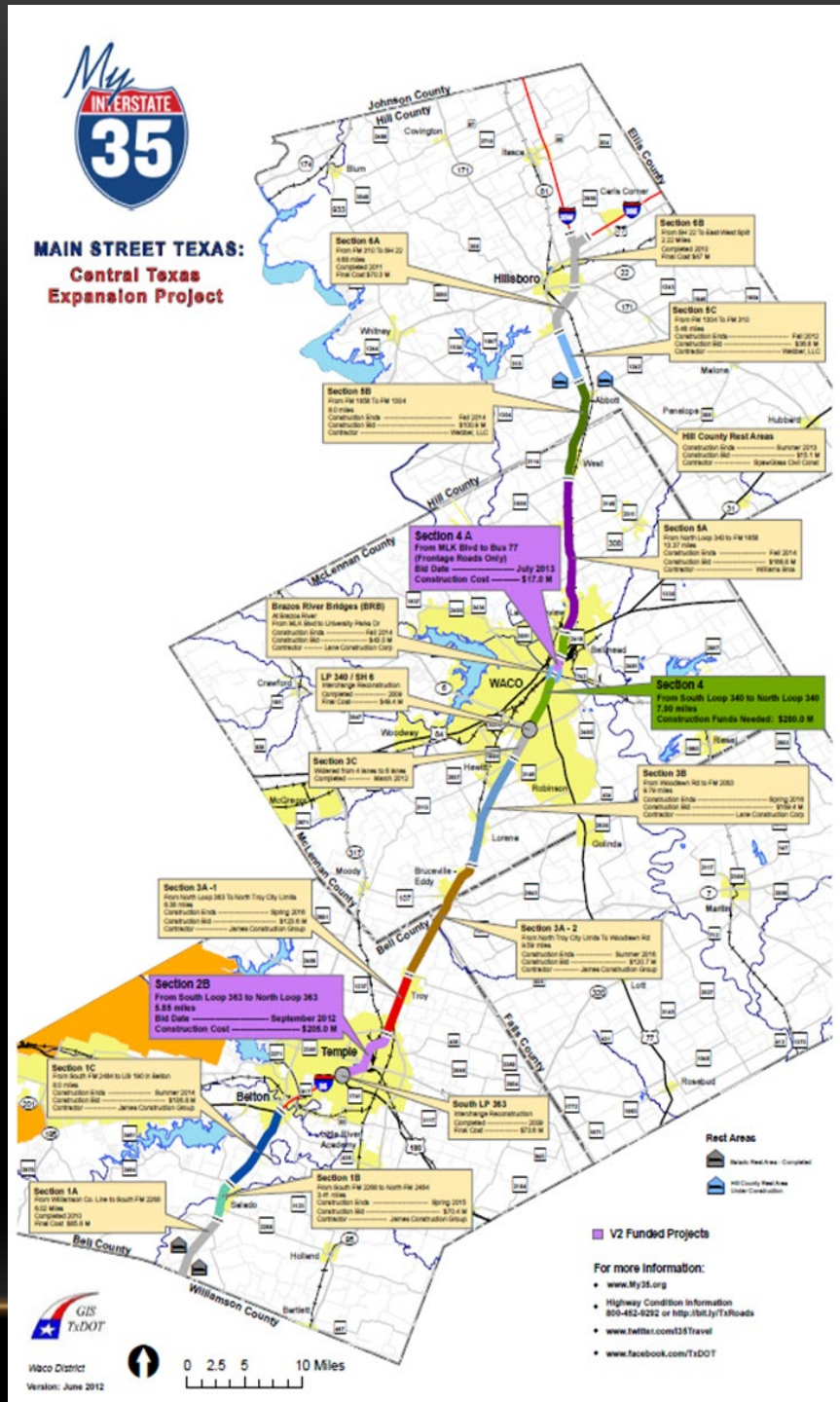
End of Queue

Texas Connected Freight Corridors

THE I-35 CENTRAL TEXAS CORRIDOR

- **Concerns:**
  - Nighttime lane closure queuing potential
  - Minimal lane closure frequency at any one location
  - Keeping equipment out of contractor's way

- **Answer:**
  - Highly-portable end-of-queue warning system
  - Deploy during lane closure TTC set-up *when needed*
  - Pick up during TTC takedown



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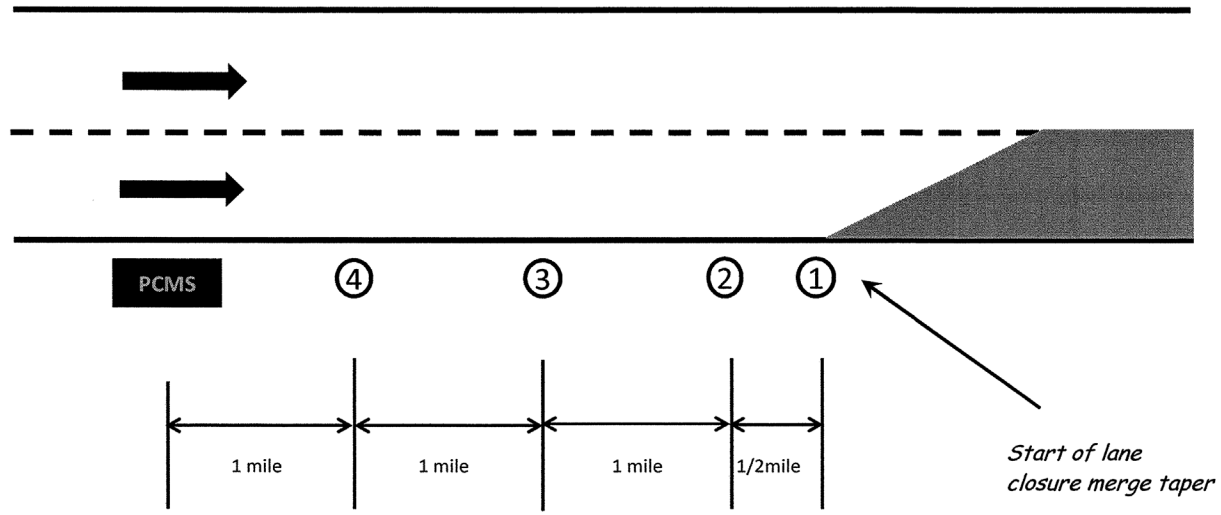
PCMS Operations Rules: Deployment Plan 1 (Max Design Queue ≤ 3.5 Miles)

PCMS Message	Last 5-Minute Average Speed V (mph)			
	④	③	②	①
ROAD WORK AHEAD	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0
SLOW TRAFFIC 3 MILES	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	40 ≤ V < 55
SLOW TRAFFIC 2 MILES	V > 55 OR V = 0.0	V > 55 OR V = 0.0	40≤ V< 55	V > 40 OR V = 0.0
SLOW TRAFFIC 1 MILE	V > 55 OR V = 0.0	40≤ V< 55	V > 40 OR V = 0.0	V > 40 OR V = 0.0
SLOW TRAFFIC AHEAD	40≤ V< 55	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0
STOPPED TRAFFIC 3 MILES	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	0.0 ≤ V < 40
STOPPED TRAFFIC 2 MILES	V > 40 OR V = 0.0	V > 40 OR V = 0.0	0.0 ≤ V < 40	Any value
STOPPED TRAFFIC 1 MILE	V > 40 OR V = 0.0	0.0 ≤ V < 40	Any value	Any value
STOPPED TRAFFIC AHEAD	0.0 ≤ V < 40	Any value	Any value	Any value



① *Non-Intrusive Traffic Speed Detector*

PCMS *Portable Changeable Message Sign*

Note: Location of the sensors and the PCMS can be adjusted

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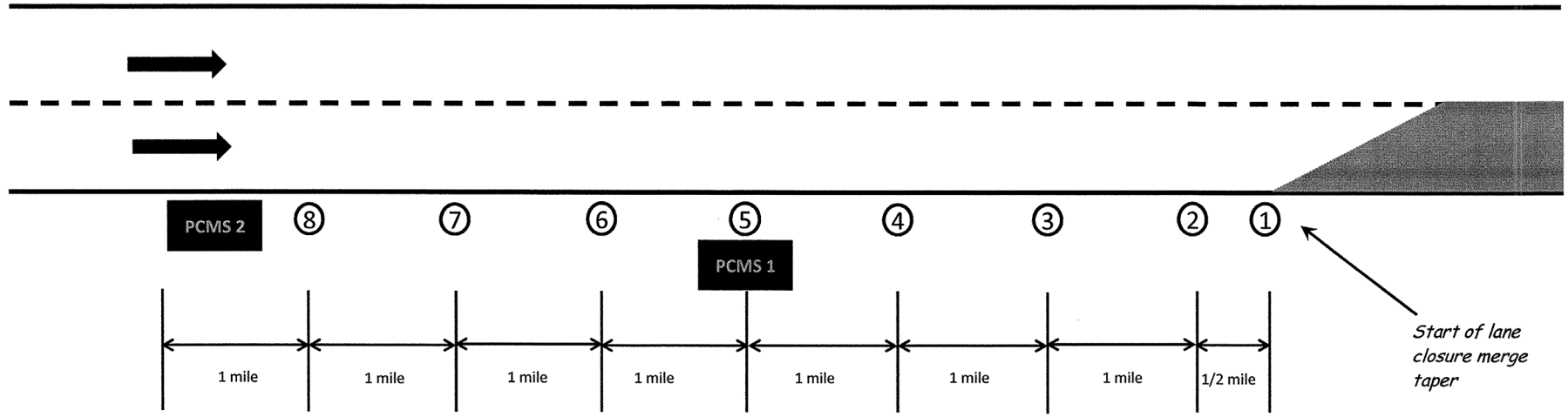
Larry J. Colclasure P.E.

LANE CLOSURE MONITORING SYSTEM PLAN 1

DN.: - LR/MT	SHEET 1 of 2
CK.: -	
DW.: - DN	



① *Non-Intrusive Traffic Speed Detector*

PCMS *Portable Changeable Message Sign*

PCMS Operations Rules: Deployment Plan 2 (Max Design Queue ≤ 7.5 Miles)

PCMS 2 Message	PCMS 1 Message	Last 5-Minute Average Speed V (mph)							
		⑧	⑦	⑥	⑤	④	③	②	①
WATCH YOUR SPEED	ROAD WORK AHEAD	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0
WATCH YOUR SPEED	SLOW TRAFFIC 3 MILES	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	40 ≤ V < 55
WATCH YOUR SPEED	SLOW TRAFFIC 2 MILES	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	40≤ V< 55	V > 40 OR V = 0.0
WATCH YOUR SPEED	SLOW TRAFFIC 1 MILE	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	40≤ V< 55	V > 40 OR V = 0.0	V > 40 OR V = 0.0
WATCH YOUR SPEED	SLOW TRAFFIC AHEAD	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	40≤ V< 55	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0
WATCH YOUR SPEED	STOPPED TRAFFIC 3 MILES	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	0.0 ≤ V < 40
WATCH YOUR SPEED	STOPPED TRAFFIC 2 MILES	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	0.0 ≤ V < 40	Any value
WATCH YOUR SPEED	STOPPED TRAFFIC 1 MILE	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	0.0 ≤ V < 40	Any value	Any value

PCMS 2 Message	PCMS 1 Message	Last 5-Minute Average Speed V (mph)							
		⑧	⑦	⑥	⑤	④	③	②	①
SLOW TRAFFIC 3 MILES	LANE CLOSED 3 MILES	V > 55 OR V = 0.0	V > 55 OR V = 0.0	V > 55 OR V = 0.0	40 ≤ V < 55	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0
SLOW TRAFFIC 2 MILES	LANE CLOSED 3 MILES	V > 55 OR V = 0.0	V > 55 OR V = 0.0	40 ≤ V < 55	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0
SLOW TRAFFIC 1 MILE	LANE CLOSED 3 MILES	V > 55 OR V = 0.0	40 ≤ V < 55	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0
SLOW TRAFFIC AHEAD	LANE CLOSED 3 MILES	40 ≤ V < 55	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0
STOPPED TRAFFIC 3 MILES	LANE CLOSED 3 MILES	V > 40 OR V = 0.0	V > 40 OR V = 0.0	V > 40 OR V = 0.0	0.0 ≤ V < 40	Any value	Any value	Any value	Any value
STOPPED TRAFFIC 2 MILES	LANE CLOSED 3 MILES	V > 40 OR V = 0.0	V > 40 OR V = 0.0	0.0 ≤ V < 40	Any value	Any value	Any value	Any value	Any value
STOPPED TRAFFIC 1 MILE	LANE CLOSED 3 MILES	V > 40 OR V = 0.0	0.0 ≤ V < 40	Any value	Any value	Any value	Any value	Any value	Any value
STOPPED TRAFFIC AHEAD	LANE CLOSED 3 MILES	0.0 ≤ V < 40	Any value	Any value	Any value	Any value	Any value	Any value	Any value

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LANE CLOSURE MONITORING SYSTEM PLAN 2

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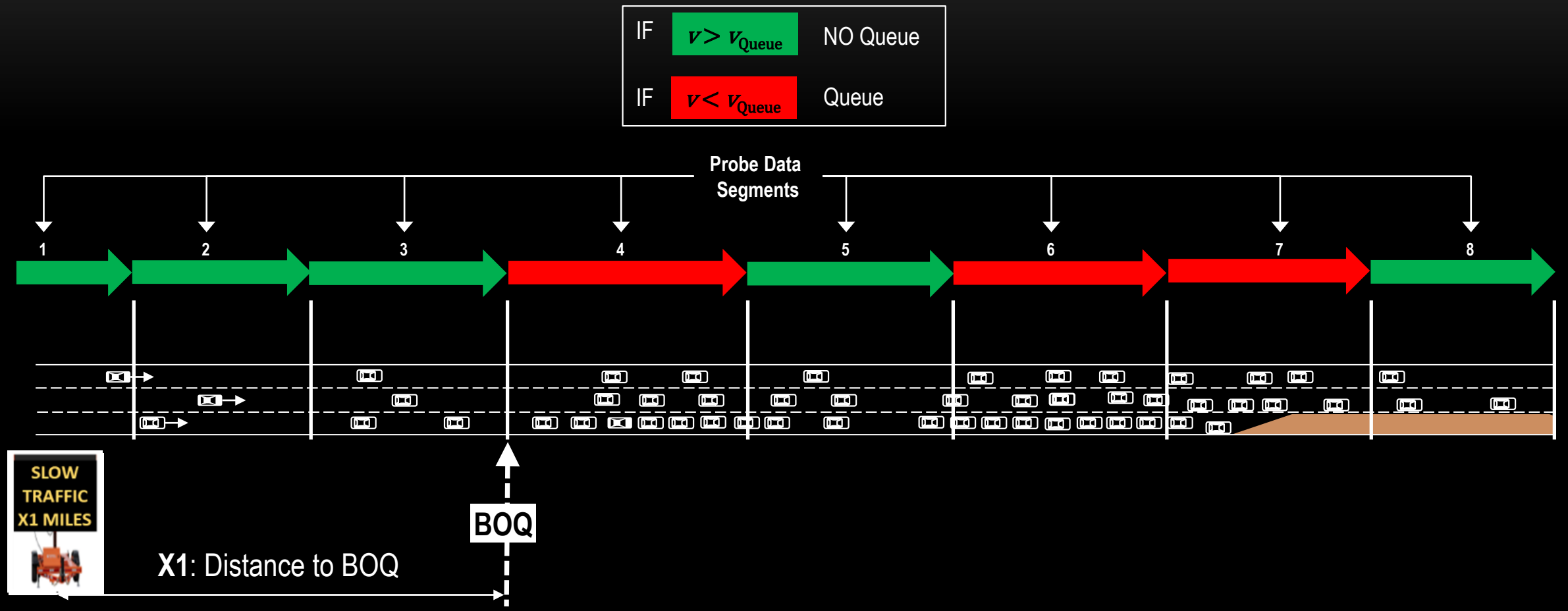
Queue Detection Using Crowd-Sourced Probe Data



I-35: SAMPLE RESULTS

- <5% of closures resulting in delays more than 30 minutes (+2800 closures to date)
- 87% think information is nearly always accurate
- 62% have changed plans based on the information
- 50% reduction in crashes over what would have occurred if EOQ systems not in place

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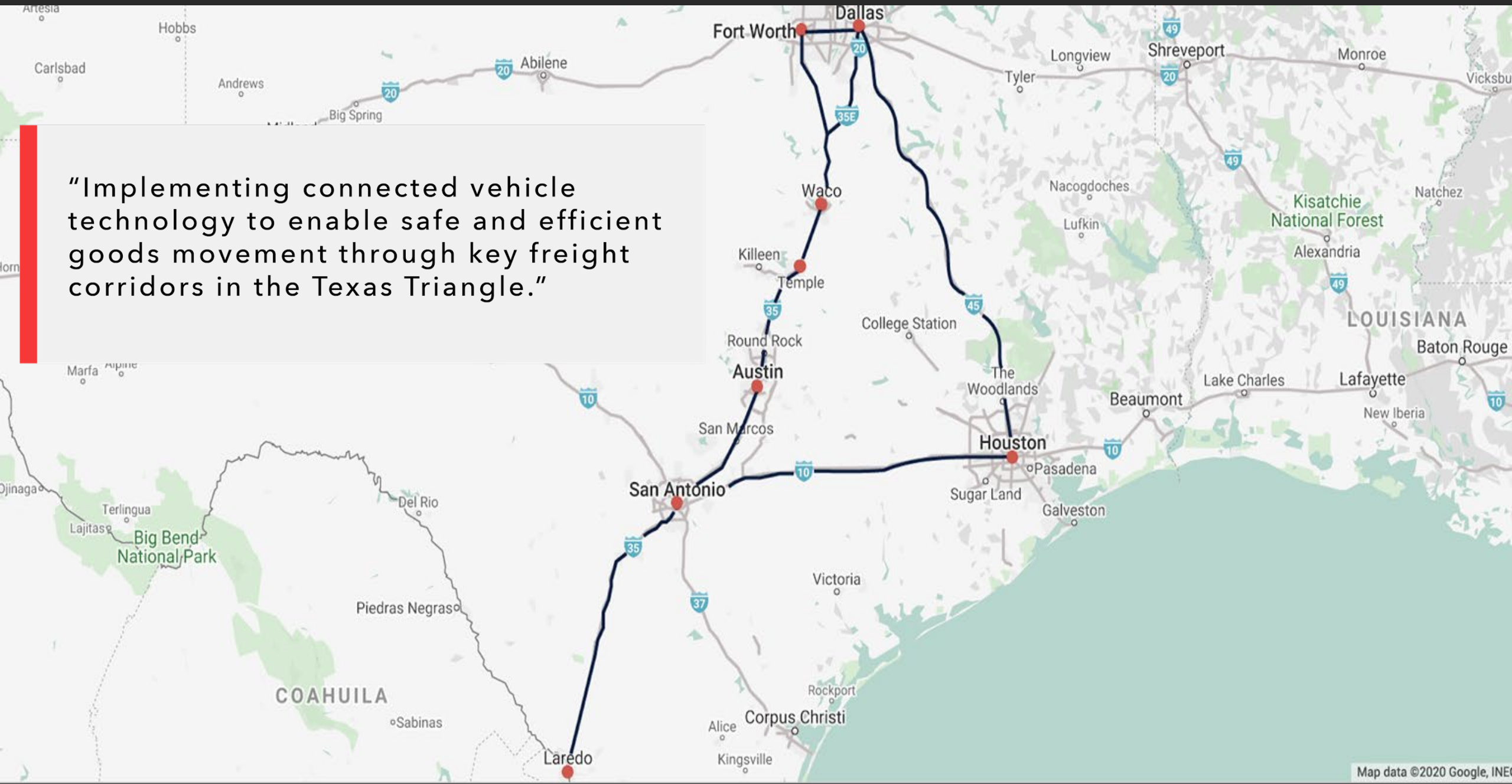
VISION



"Implementing connected vehicle technology to enable safe and efficient goods movement through key freight corridors in the Texas Triangle."

APPLICATION AREAS

TIERS				
01	Work Zone Warning	Queue Warning	Wrong-Way Drivers	Advanced Traveler Information System (ATIS)
02	Freight Signal Priority	Road Weather Warning	Truck Parking Availability	Bridge Height Warning
03	Emergency Electronic Brake Light	Pedestrian & Animal Warning	Eco-Dynamic Routing	Border Wait Times

RSU DEPLOYMENT