



International  
Road Dynamics Inc.

# *Deployment and Evaluation of ITS Technology in Work Zones*





International  
Road Dynamics Inc.

- Background
- Michigan Lane Merger System Evaluation
- Other ITS Applications to Work Zones



**CUSTOMER  
DRIVEN™**



# The Congestion Problem



International  
Road Dynamics Inc.

- Urban traffic congestion costs an estimated \$67.5 Billion in wasted fuel (5.7 billion gallons) and lost time (3.6 billion hours) in 75 major US Urban areas (TTI 2002 Urban Mobility Study)
- Lane rental charges during construction, meant to reflect road user delay costs, can be as high as \$60,000/hour/lane during peak periods (Work Zone Best Practices Guidebook)



**CUSTOMER  
DRIVEN™**



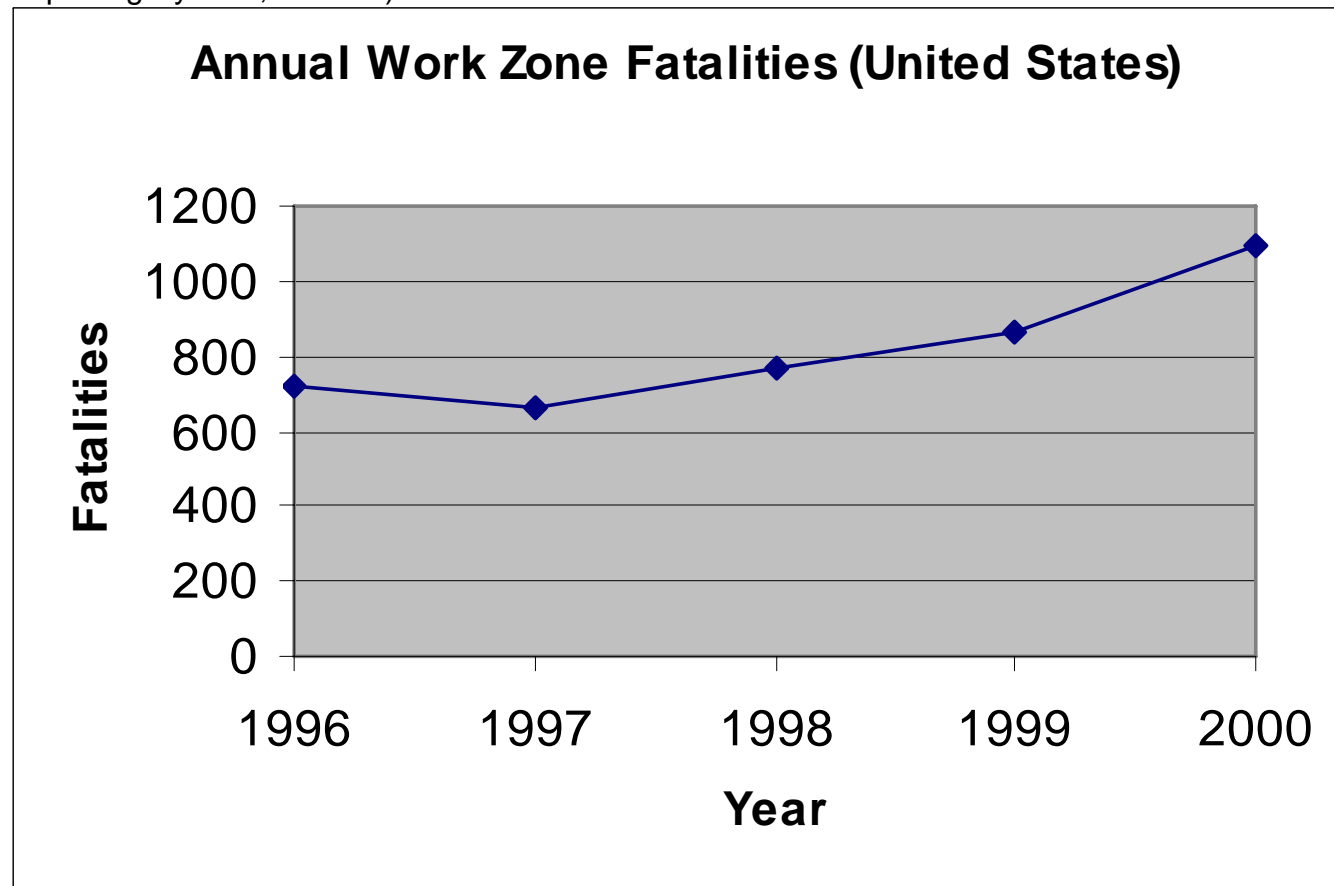
# The Safety Problem



International  
Road Dynamics Inc.



- Work zone accidents resulted in 1079 fatalities in 2001 (Fatal Accident Reporting System, NHTSA)



# Work Zone Accidents



International  
Road Dynamics Inc.



**CUSTOMER  
DRIVEN™**



- 2-3% of all reported accidents occur in or around work zones
- Driver inattention and excessive speed leading causes
- More victims were automobile drivers and passengers than workers
- Higher percentage of side swipe and rear end accidents
- Over 40% of accidents occur in transition area

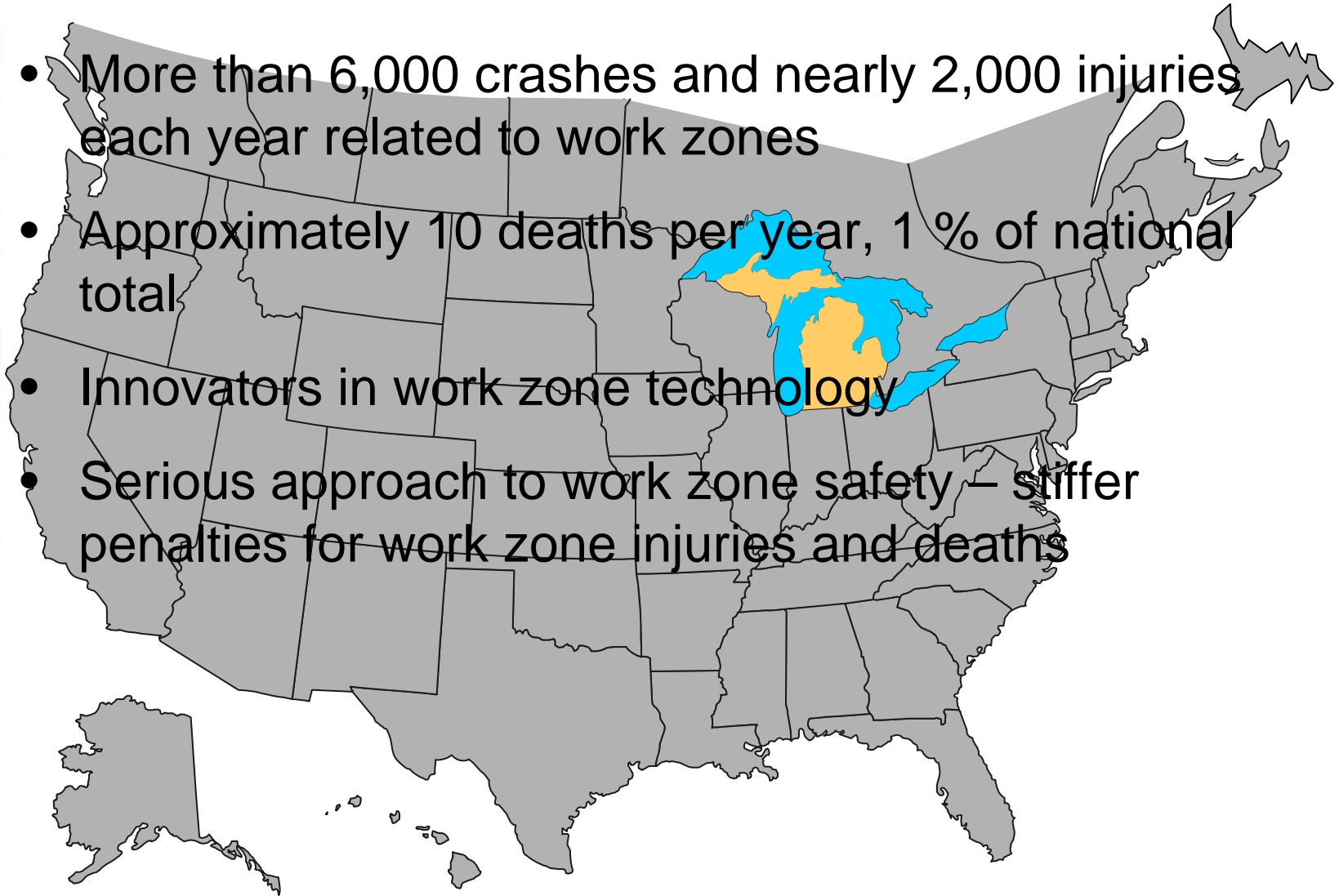
(Oregon DOT, Work Zone Facts at a Glance)

# *The Situation in Michigan*



International  
Road Dynamics Inc.

- More than 6,000 crashes and nearly 2,000 injuries each year related to work zones
- Approximately 10 deaths per year, 1 % of national total
- Innovators in work zone technology
- Serious approach to work zone safety – stiffer penalties for work zone injuries and deaths



# Lane Merge Problems



International  
Road Dynamics Inc.

- Late lane changes result in:
  - ⊗ Higher accident potential at merge point
  - ⊗ Traffic flow disruption
  - ⊗ Deteriorating concern for work zone caution by drivers
  - ⊗ Increased frustration level for drivers
- Dynamic Lane Merger developed to address these problems



**CUSTOMER  
DRIVEN™**



# Michigan Dynamic Lane Merger Evaluation



International  
Road Dynamics Inc.

- Two year study completed by Wayne State University (Dr. Tappan Datta) in December 2001
- Implementation of dynamic lane merge system at 6 locations to study deployment issues and effectiveness
- Phase I (2000) – Deployment and configuration
- Phase II (2001) - Effectiveness



**CUSTOMER  
DRIVEN™**



# *Dynamic Lane Merger Trailer*



International  
Road Dynamics Inc.



**CUSTOMER  
DRIVEN™**



I-69 Near Lansing, Michigan

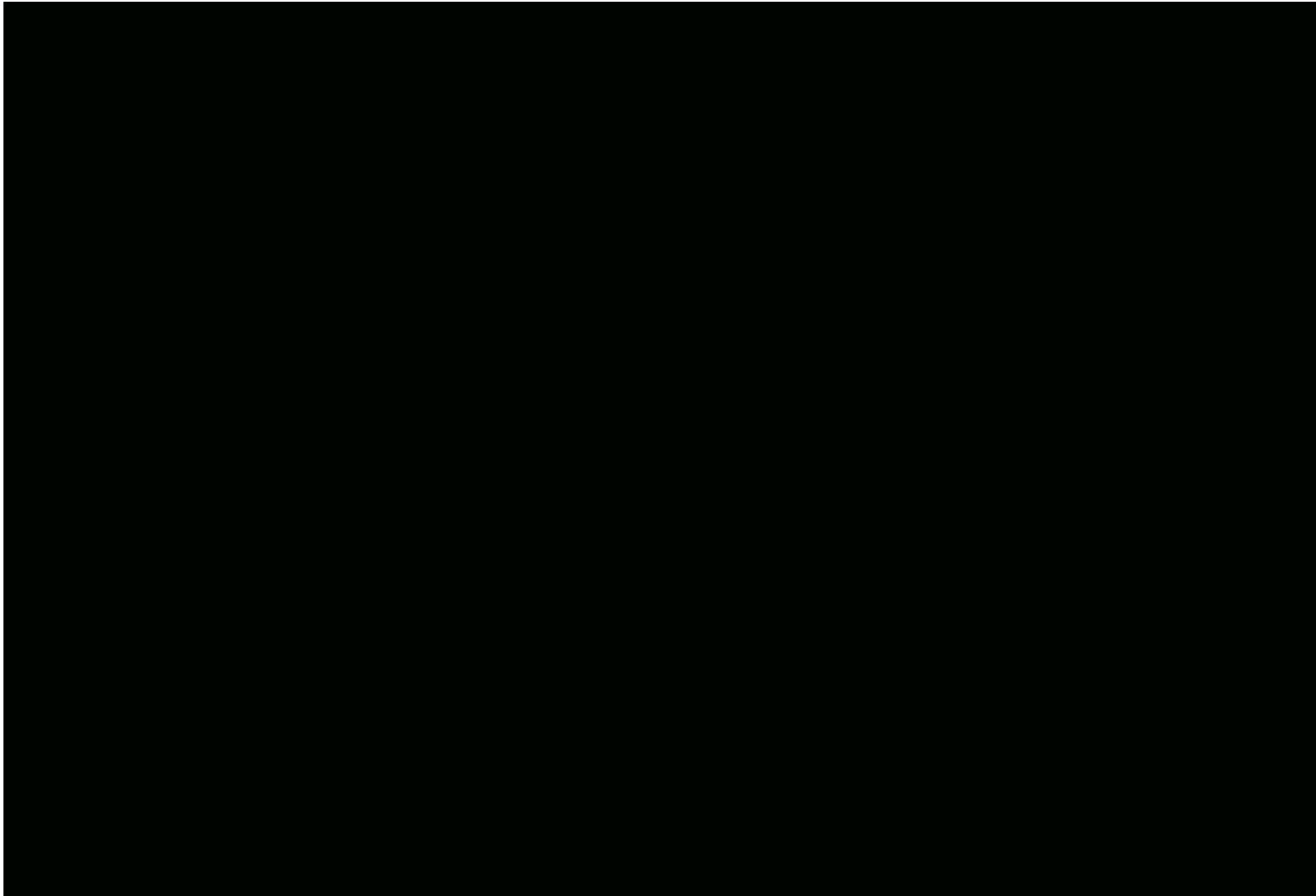
# *Dynamic Lane Merger System Operation*



International  
Road Dynamics Inc.



**CUSTOMER  
DRIVEN™**



# Evaluation of Dynamic Lane Merger



International  
Road Dynamics Inc.



CUSTOMER  
DRIVEN



Two year study completed by Wayne State University in December 2001:

- **Conclusion: “Can be very helpful in reducing aggressive driver behavior, increasing safety and reducing delay at work zones where lane closures are necessary.”**
- Examined best configuration for positive guidance to motorists
- Measured impact of system on traffic
- Provided recommendations for future deployments

# Evaluation of Dynamic Lane Merger



International  
Road Dynamics Inc.

- The average peak period travel time decreased by over 30%
- The average number of stops and duration of stops were decreased
- The number of aggressive driver maneuvers (late merges) during peak hours were reduced by 50-75%
- B/C (Benefit/Cost) ratio is greater than one, if the value of time of \$3.80 per person hour is assumed for travel time savings



**CUSTOMER  
DRIVEN™**



# *Michigan Work Zone ITS Projects*



International  
Road Dynamics Inc.

- Lane merger study by Michigan DOT and Wayne State University – 3 lanes to 2 lanes
- Variable Speed Limit system study – FHWA field-test and evaluation
- Real Time Information System



**CUSTOMER  
DRIVEN**



# *Speed Issues in Work Zones*



International  
Road Dynamics Inc.

- Excessive speeds and driver inattention leading causes of work zone accidents
- Static signs either not noticed or not considered relevant by motorists
- Static signs not relevant in many cases when workers are not present which reduces effectiveness
- High speed differential between free flow approach and congested work zone area



**CUSTOMER  
DRIVEN™**



# *Speed Ranger* (Variable Speed Limit System)



International  
Road Dynamics Inc.



**CUSTOMER  
DRIVEN™**

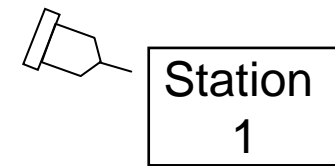
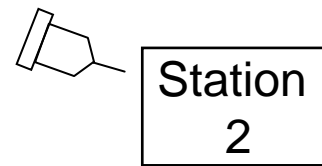
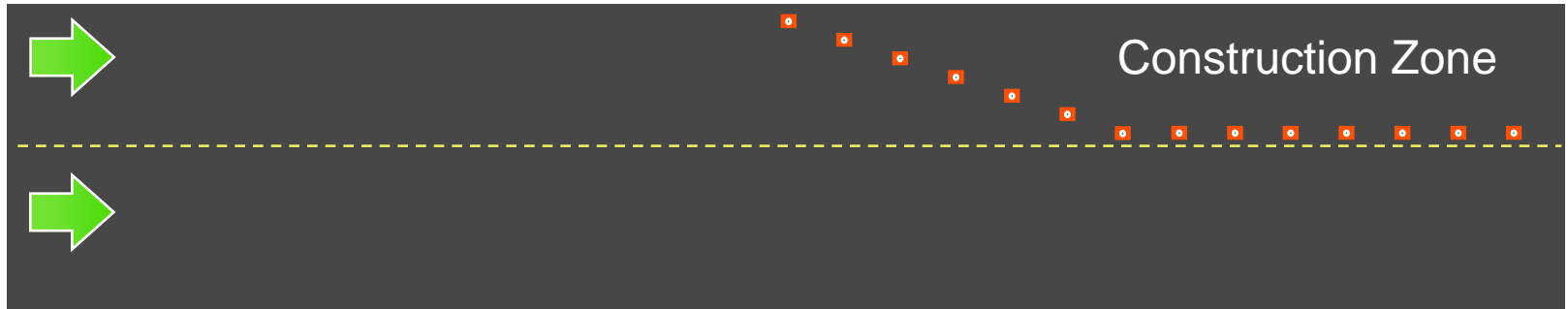


I-96 Lansing, Michigan

# Speed Ranger System Layout



International  
Road Dynamics Inc.



Each Station consists of:

- Traffic monitoring sensor
- Trailer
- Power System
- Speed limit display
- Controller with RF communications

# *Speed Ranger Performance*



International  
Road Dynamics Inc.

- Evaluation conducted by Michigan State University (Rick Lyles) based on deployment at 4 sites in 2002
- Measures of effectiveness include average speed, speed variance, travel time, and excess speed
- Analysis still underway, some early indications:
  - ⊕ May reduce travel time
  - ⊕ May significantly reduce excess speeds (number of vehicles over 60 mph and 70 mph)



**CUSTOMER  
DRIVEN™**



# *Work Zone Travel Information*



International  
Road Dynamics Inc.

- Motorists want to know what is happening
- Informed motorists are less likely to become frustrated and drive aggressively
- Gives control back to the driver to choose an alternate route
- Relieves demand and congestion by encouraging selection of alternate routes or modified travel plans



**CUSTOMER  
DRIVEN™**



# *Travel Messenger (Real Time Information System)*



International  
Road Dynamics Inc.



**CUSTOMER  
DRIVEN™**



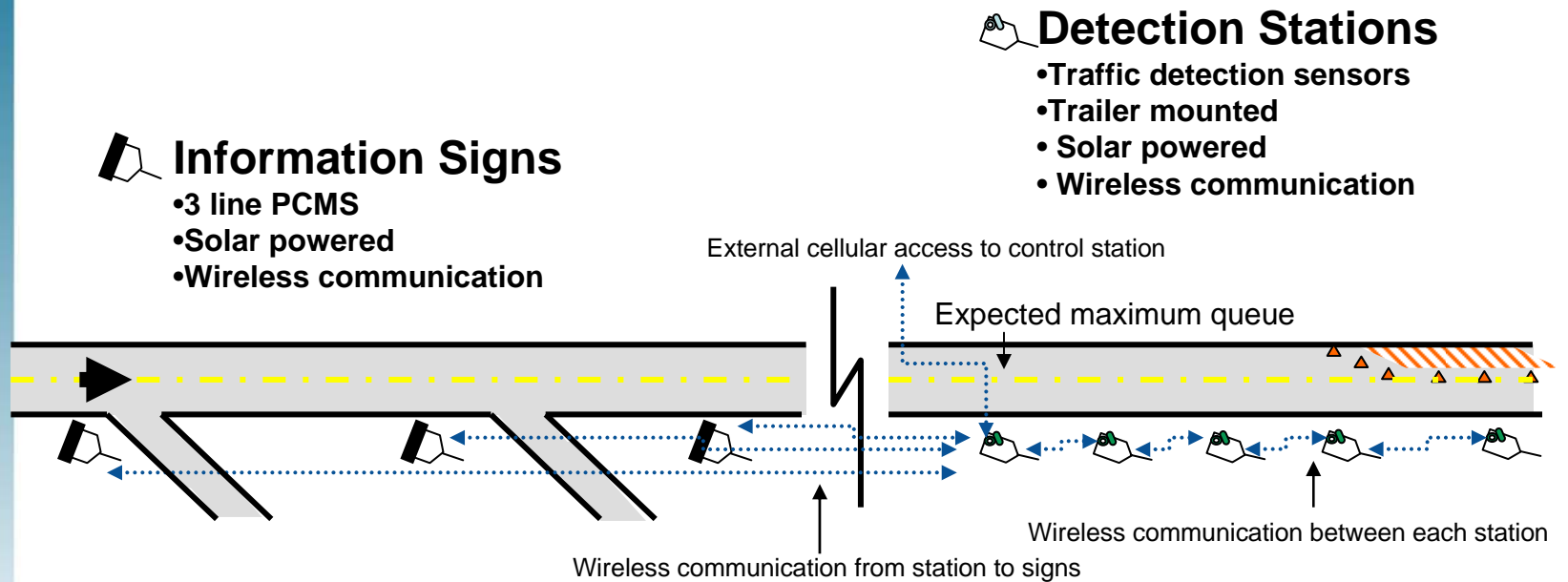
# Travel Messenger

## General Layout



International  
Road Dynamics Inc.

### Work Zone Information System



# *Travel Messenger Performance*



International  
Road Dynamics Inc.

- Deployed in Michigan during 2002 construction season on I-75
- No formal evaluation conducted
- Observations
  - ⊕ Accuracy in compliance with requirements
  - ⊕ Met functional requirements



**CUSTOMER  
DRIVEN™**





International  
Road Dynamics Inc.

*Thank you*  
*Any Questions?*

