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Deployment and Evaluation of ITS Technology in Work Zones





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



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The Congestion Problem



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- 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)



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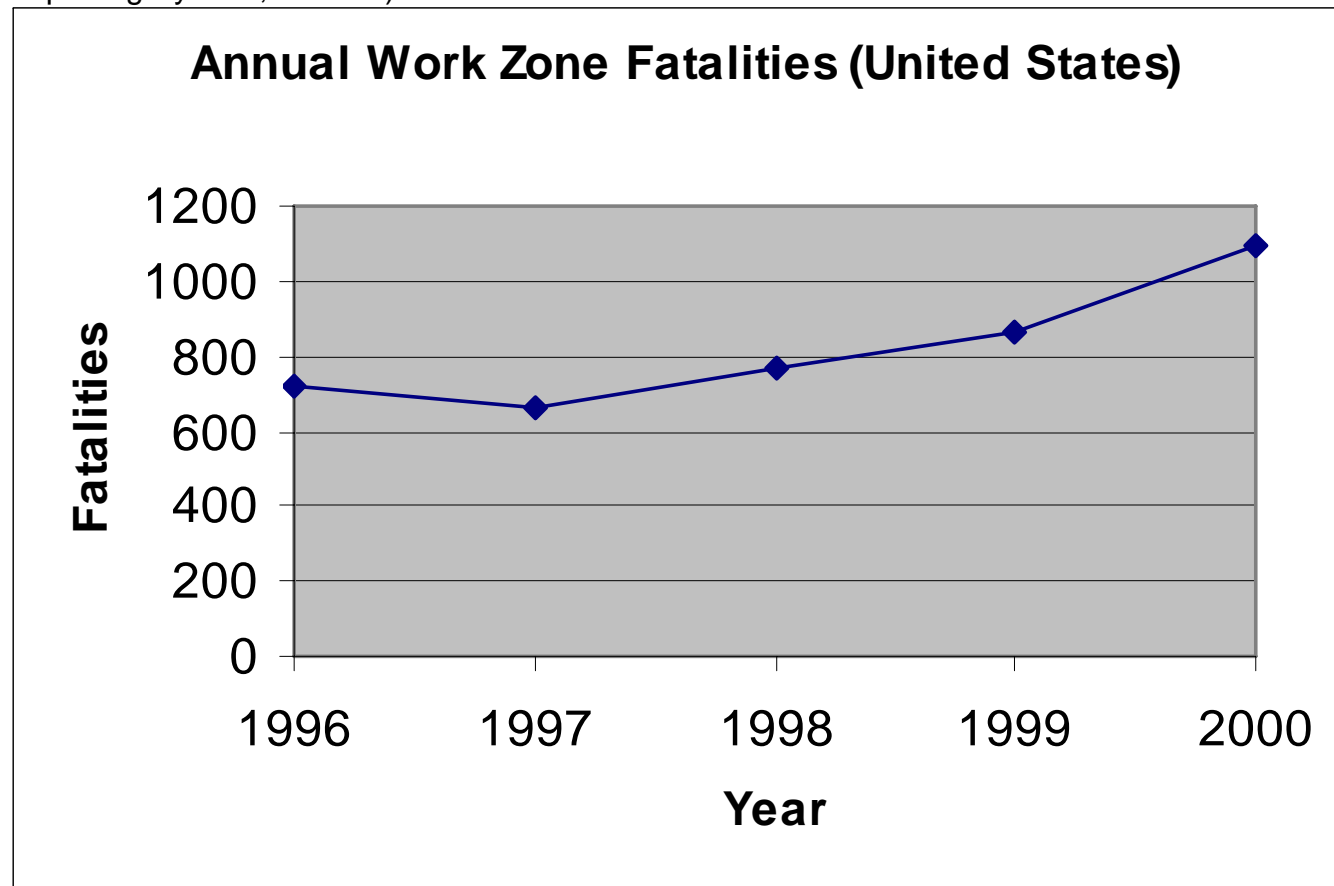
The Safety Problem



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



Work Zone Accidents



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- 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

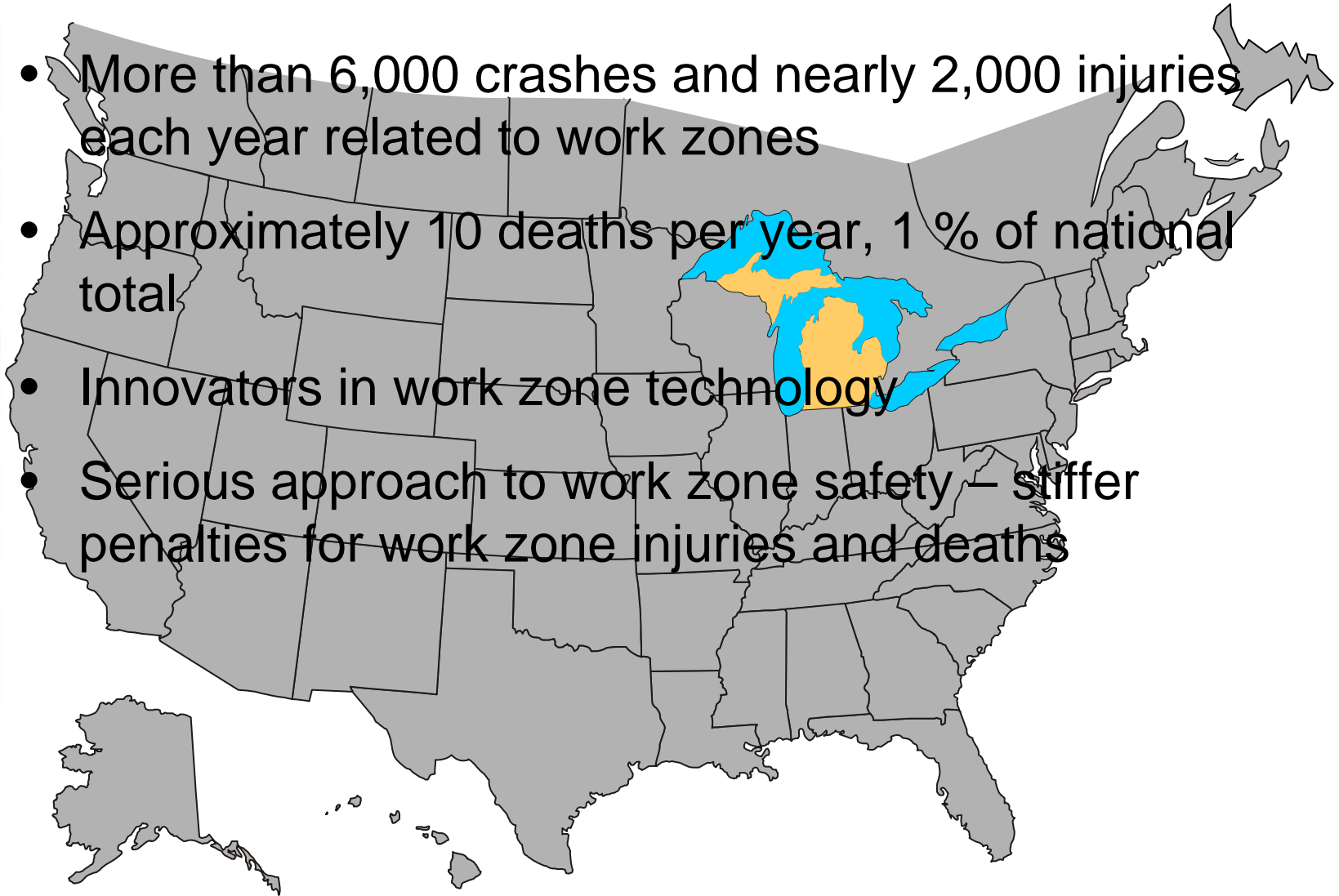
(Oregon DOT, Work Zone Facts at a Glance)

The Situation in Michigan



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- 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



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- 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



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Michigan Dynamic Lane Merger Evaluation



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- 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



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Dynamic Lane Merger Trailer



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I-69 Near Lansing, Michigan

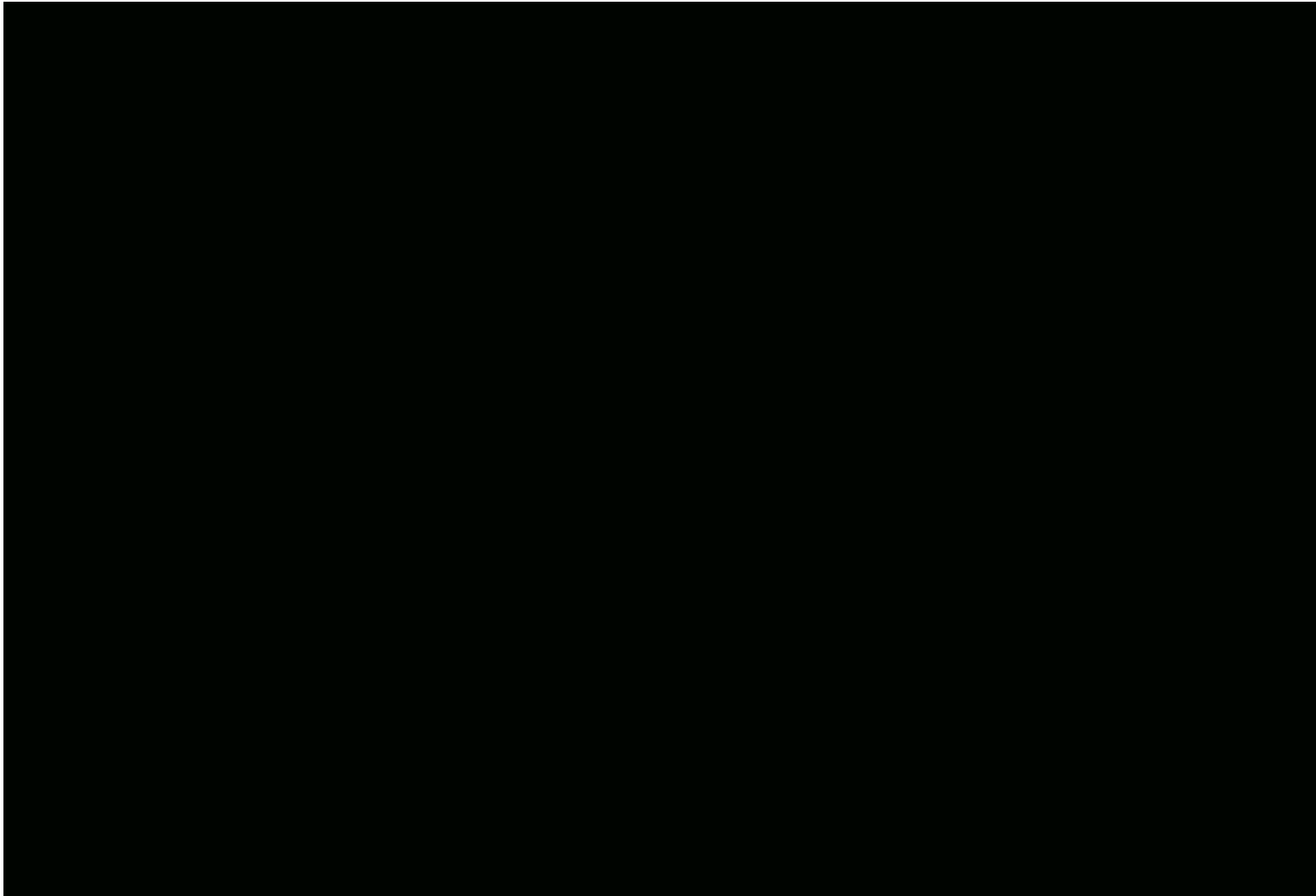
Dynamic Lane Merger System Operation



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Evaluation of Dynamic Lane Merger



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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



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Evaluation of Dynamic Lane Merger



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- 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



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Michigan Work Zone ITS Projects



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- 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



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Speed Issues in Work Zones



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- 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



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Speed Ranger (Variable Speed Limit System)



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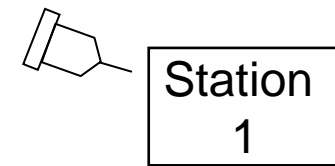
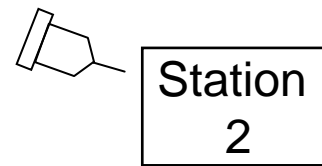
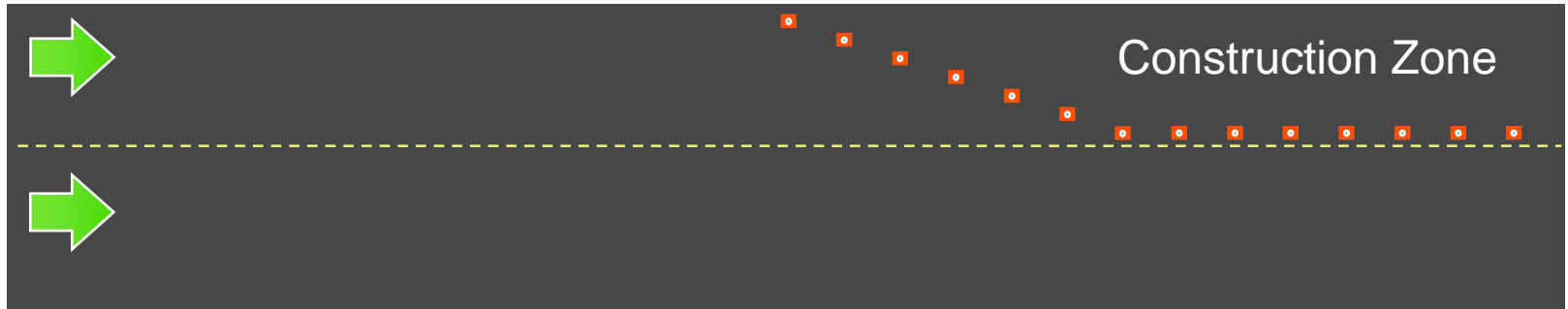


I-96 Lansing, Michigan

Speed Ranger System Layout



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Each Station consists of:

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

Speed Ranger Performance



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- 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)



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Work Zone Travel Information



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- 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



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Travel Messenger (Real Time Information System)



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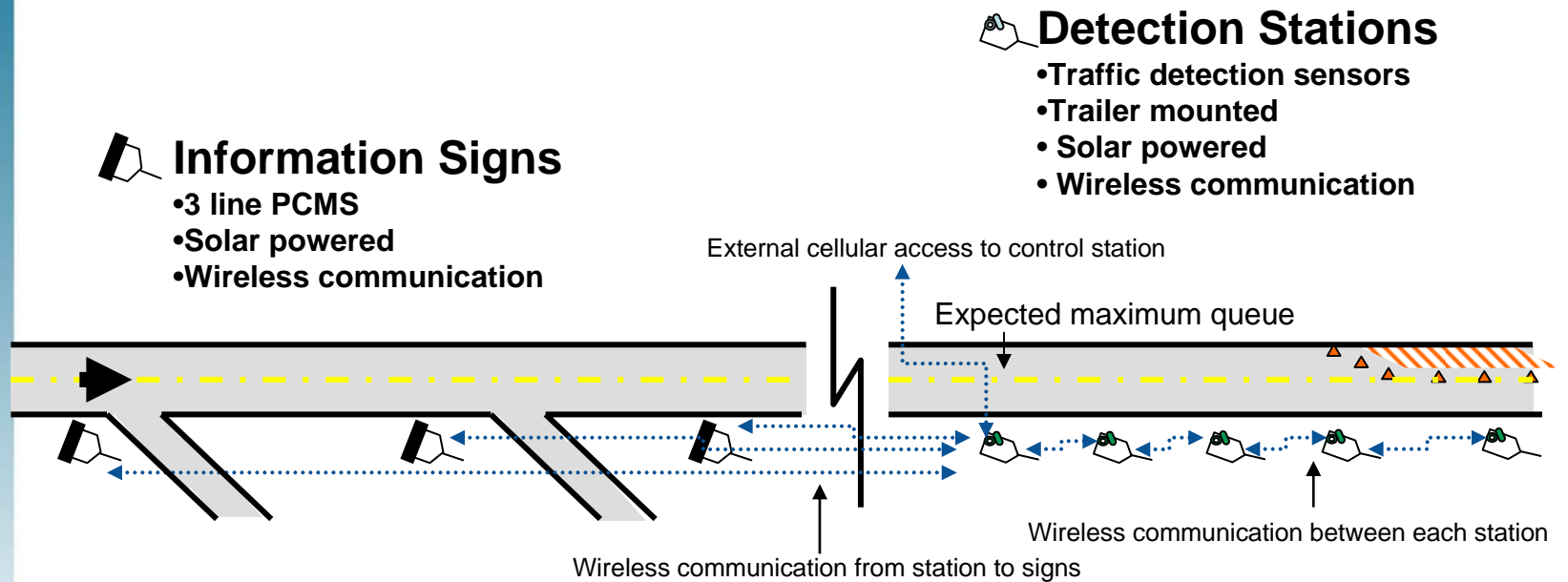
Travel Messenger

General Layout



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Work Zone Information System



Travel Messenger Performance



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



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Thank you
Any Questions?

