



Work Zone Performance Measurement - Safety

Work Zone Performance
Management Peer Exchange
Workshop

May 8, 2013 ♦ Atlanta, Georgia

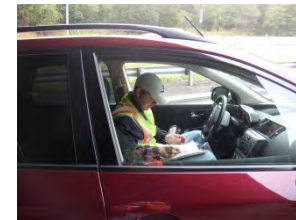
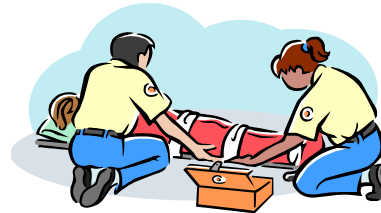


***Texas A&M
Transportation
Institute***

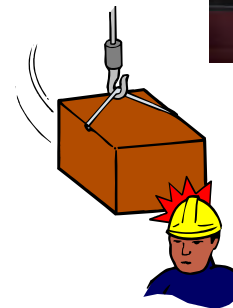
Safety-Related Performance Measures

Safety impacts commonly measured as

- Crashes
- Safety Surrogates
- Worker Accidents



Source: TTI





Work Zone Crash Performance Measures

- # Crashes or change in # of crashes
 - Per time period(s) of interest
- Change in crash rate per vehicle mile traveled
 - Per time period(s) of interest
 - Aggregated across projects
- Change in % distribution of crashes by severity, type, manner of collision, etc.
- Change in crash costs

Crashes

Existing Agency Data Sources

- Statewide traffic crash records database entries
- Crash report forms (hard-copy or electronic)
- TOC incident database entries
- Emergency response/service patrol dispatch logs



Source: Las Vegas FAST

Future Sources

- Agency-collected work zone crash information
- Connected vehicle initiative data

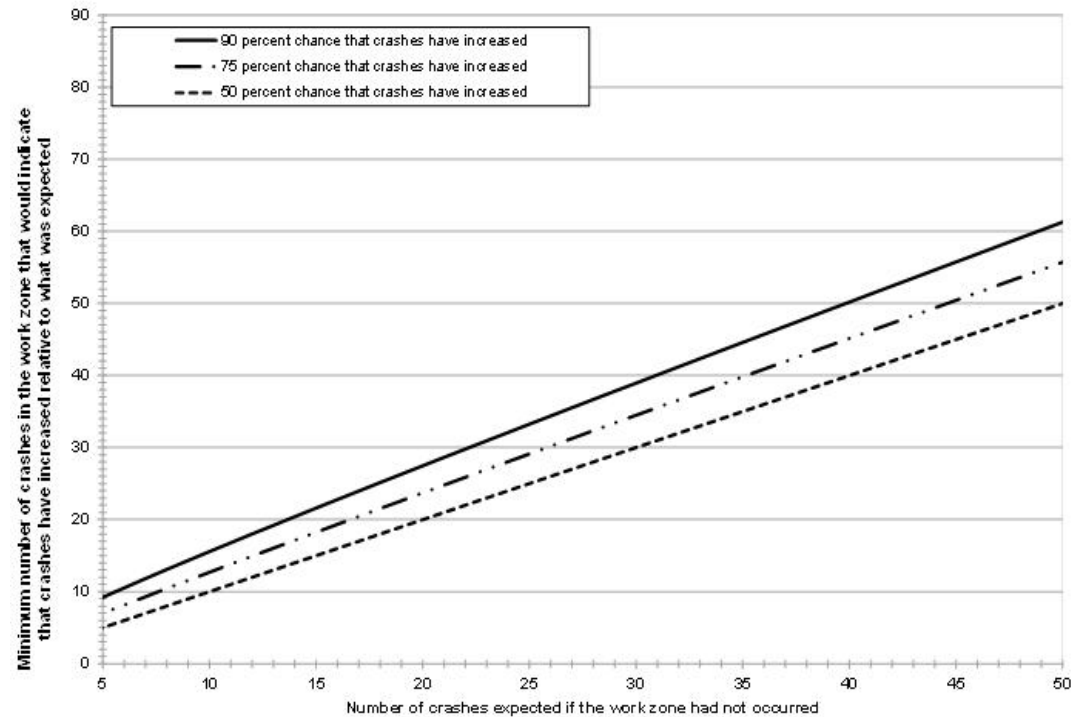


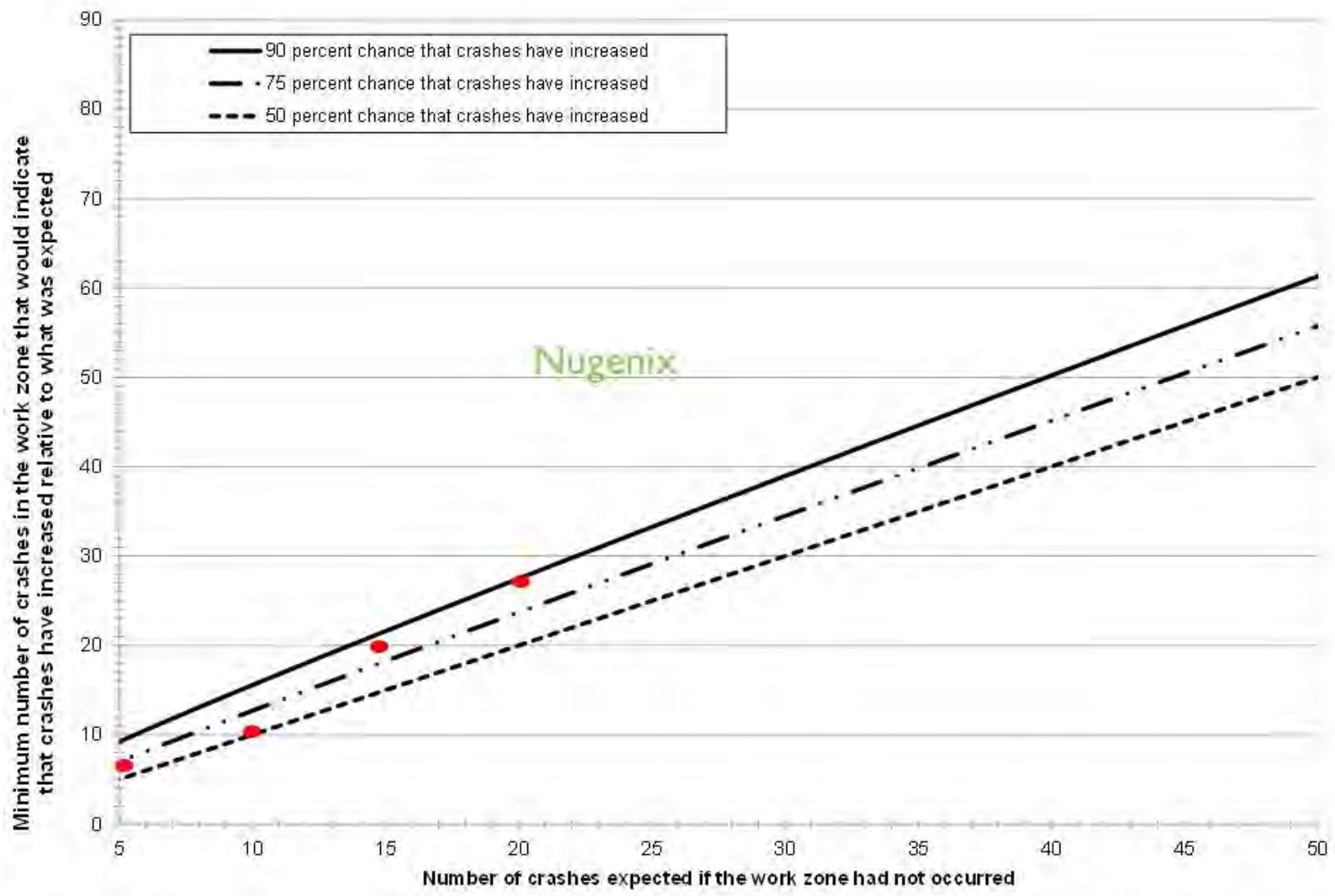
Data Source	Key Considerations and Trade-offs
Statewide Crash Records Database	<ul style="list-style-type: none">• Limited work zone features and activities information• Time lags in obtaining crash data for a given work zone
Electronic or hard copy crash report forms	<ul style="list-style-type: none">• Limited work zone features and activities information• Requires manual coding• May need to work with multiple enforcement agencies
TOC operator incident logs	<ul style="list-style-type: none">• Includes non-reported as well as reported crashes• Includes non-crash events
Dispatch Logs of Emergency Response or Service Patrols	<ul style="list-style-type: none">• Likely to include non-traffic crash events as well• Potential privacy concerns
Agency-collected crash and work zone database	<ul style="list-style-type: none">• Significant agency effort required• Requires upper agency support and emphasis
Connected vehicle data	<ul style="list-style-type: none">• Date of availability still uncertain

Tracking Crash Frequency Trends

Case 1:

- Work zone on roadway that normally experiences 5 crashes per month
- Have had 7, 3, 10, 7 crashes in past 4 months during work zone (+40%, -40%, +100%, +40%)

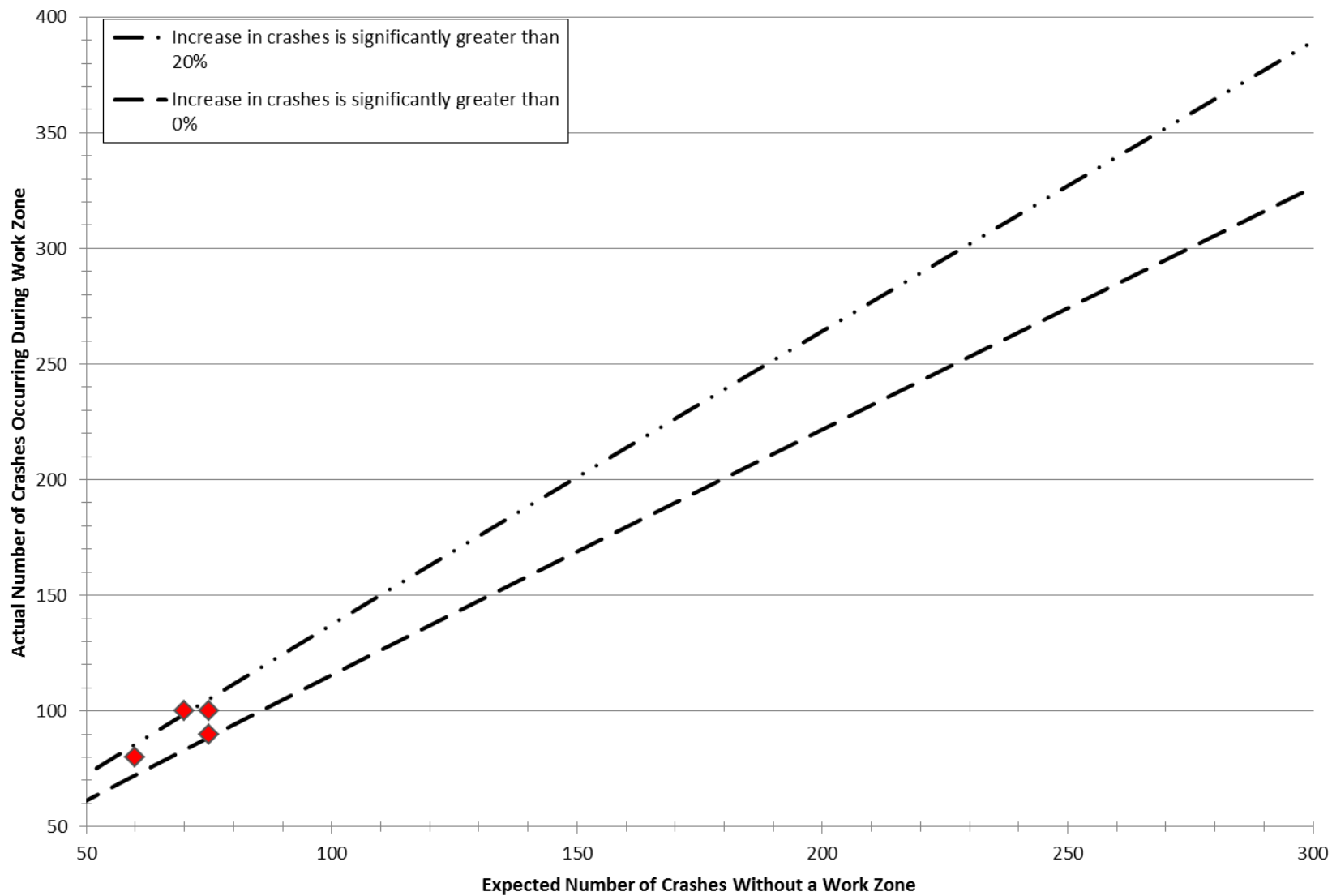


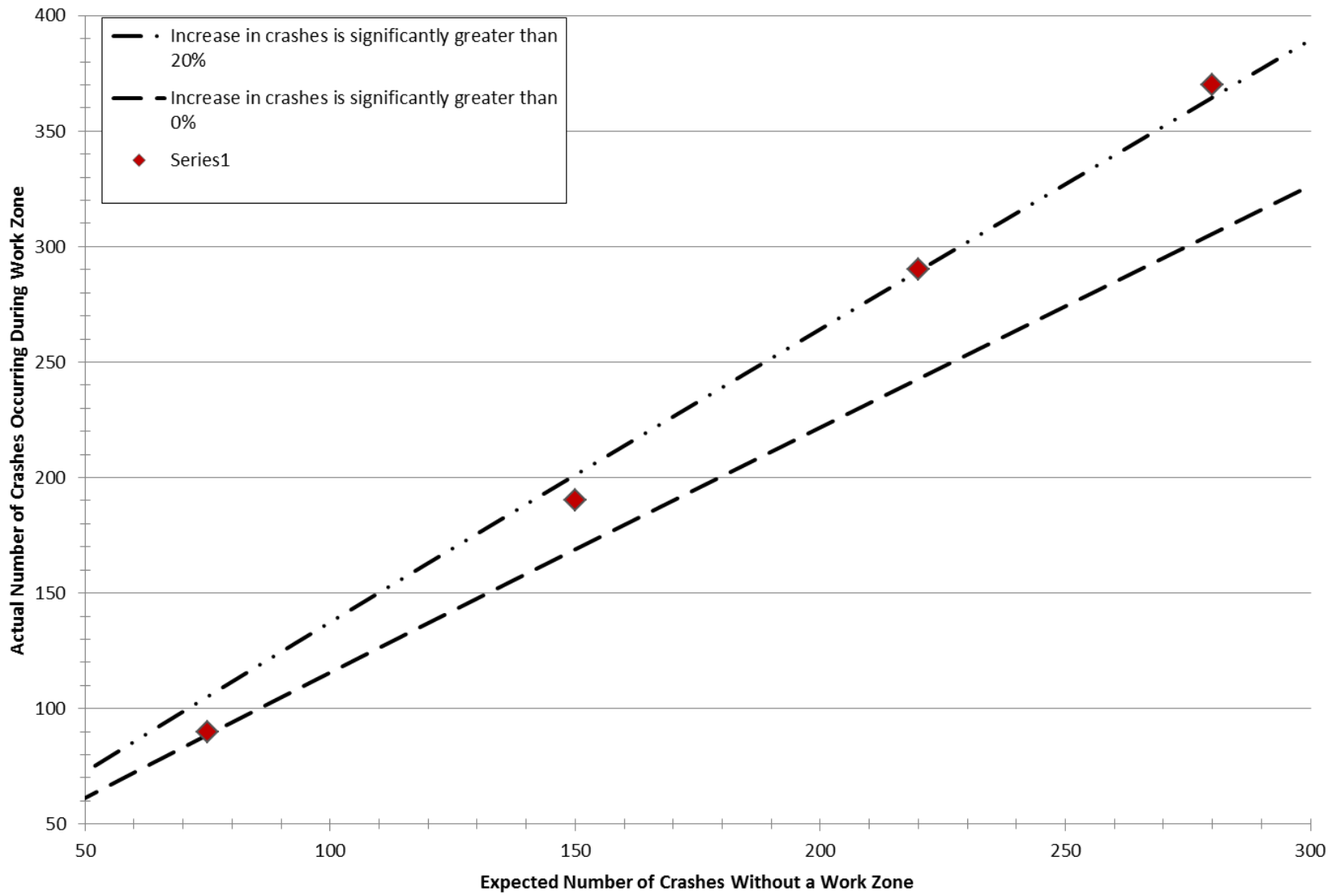




Tracking Work Zone Crash Trends (cont'd)

Typical Number of Crashes	Actual Crashes in Work Zone	Change for Month
75	90	+20%
75	100	+33%
70	100	+43%
60	80	+33%







Work Zone Safety Surrogate Performance Measures

- Speeds
 - Compliance percentage
 - Variance
- Change in emergency response dispatches
- Work zone inspection scores
- Frequency of erratic maneuvers
 - High deceleration rates
 - Short times-to-collision (headways)
 - Forced merges

Safety Surrogates

Existing Agency Data Sources

- Speed data collected by hand-held devices
- Speed data extracted from ITS sensors
- Travel times
- Videotaped traffic behaviors at key locations
- Work zone inspection scores

2012 WORK ZONE SAFETY AUDITS - EVALUATION FORM

PROJECT NAME: _____ DATE: _____

LOCATION: _____

SAFETY MESSAGE: _____

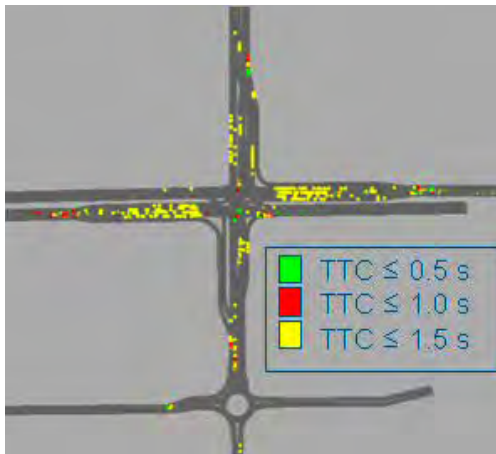
GENERAL NOTES: _____

Only score Devices you addressed on the Project. If a certain Device was not present, do not score.

CATEGORIES	QUALITY	SCORE				NOTES
		1	2	3	4	
TEMPORARY SIGNING (Signs, Flags, Support)	PLACEMENT					
CHANNELIZATION DEVICES (Tubular Markers, Cones, Drums, Barricades)	BARRELIERS					
PAVEMENT MARKINGS (Paint, Tape, Reflective & Fluorescent Markers)	CONTOURS					
CONCRETE BARRIER	PLACEMENT					
IMPACT ATTENUATORS (Crash Attenuators, Water-Sink & TBM)	CONTOURS					
PORTABLE CHANGEABLE MESSAGE SIGNS (POMS)	PLACEMENT					Cause message Present
SEQUENTIAL ARROW PANEL (Arrow Board)	CONTOURS					
TEMP TRAFFIC SIGNALS	SETUP					
BICYCLE, PEDESTRIAN & ADA FACILITIES (Signs of existing facilities affected by construction)	INSTALLATION					
FLAGGERS	PERFORMANCE					
PILOT CARS	EQUIPMENT					
MISCELLY (Time elapsed at flagger or sign of flagger)	PERFORMANCE					
WORKER GARMENTS & EQUIPMENT	BARRELIERS					
SITE HOUSEKEEPING	EQUIPMENT					
POLICE ENFORCEMENT	ON-SITE					
DRIVER FRIENDLY WORK ZONE	PERFORMANCE					This category for information only. Do not include in "TOTAL"
GRAND TOTAL						FINAL SCORE

© 2012 FHWA. Page 4

Source: Oregon DOT



Future Sources

- Microscopic traffic simulation output
- Connected vehicle initiative data

Source: Gettman et al. FHWA-HRT-08-051

Data Source	Key Considerations and Trade-offs
All data types	<ul style="list-style-type: none"> • Correlation to crashes not yet fully verified • Most can be obtained relatively quickly
TOC or work zone ITS speed sensor data	<ul style="list-style-type: none"> • Value of data depends on the locations of the sensors. • Need to verify data availability and archival once work starts
Speed data collected with hand-held radar or lidar	<ul style="list-style-type: none"> • Data collection easy to accomplish • Useful for assessing speed behaviors • Inconspicuous data collection techniques required
Travel times through the work zone	<ul style="list-style-type: none"> • Speed change locations can indicate problems • Can be used to assess compliance with wz speed limit
Videotaped traffic behavior	<ul style="list-style-type: none"> • Can be difficult to find a unobtrusive viewing point • Data analysis is labor intensive • Requires precise definition of behaviors of interest



Data Source	Key Considerations and Trade-offs
Work zone inspection scores	<ul style="list-style-type: none">• Requires significant effort to establish scoring/ratings• Correlation of scores to actual safety levels not yet verified
Traffic simulation output (analyzed with SSAM)	<ul style="list-style-type: none">• Significant coding and calibration effort required• Correlation to actual work zone safety conditions not yet verified
Connected vehicle data	<ul style="list-style-type: none">• Date of availability still uncertain



Worker Accident Performance Measures

- Frequency of worker accidents
- Worker injury rates per hours of work
- Distributions of injury types, contributing factors

Worker Accidents

Existing Agency Data Sources


- Agency or contractor worker injury records
- State worker compensation commission accident statistics
- Bureau of Labor statistics database



Source: TTI

Future Sources

- Connected vehicle initiative data



Data Source	Key Considerations and Trade-offs
Agency or contractor worker injury records	<ul style="list-style-type: none"> • Use must be monitored due to privacy concerns • Small sample size for many companies will make it difficult to identify trends
State worker compensation commission statistics	<ul style="list-style-type: none"> • Useful for comparisons to agency or contractor accident trends • Level of detail will be limited
BLS, OSHA worker accident statistics	<ul style="list-style-type: none"> • Useful for comparisons to agency or contractor accident trends • Level of detail will be limited
Agency-collected work zone crash and accident database	<ul style="list-style-type: none"> • Significant effort required • Requires upper agency support and emphasis • Use of accident reports must be monitored carefully due to privacy concerns



Discussion

- Are there other Safety-related measures you have thought about using in your agency? Why are you considering those?
- How would you use these or other safety measures to decide how to modify your agency's current policies or practices?