Pedestrian Safety Countermeasures Deployment and Evaluation: Las Vegas Case Study

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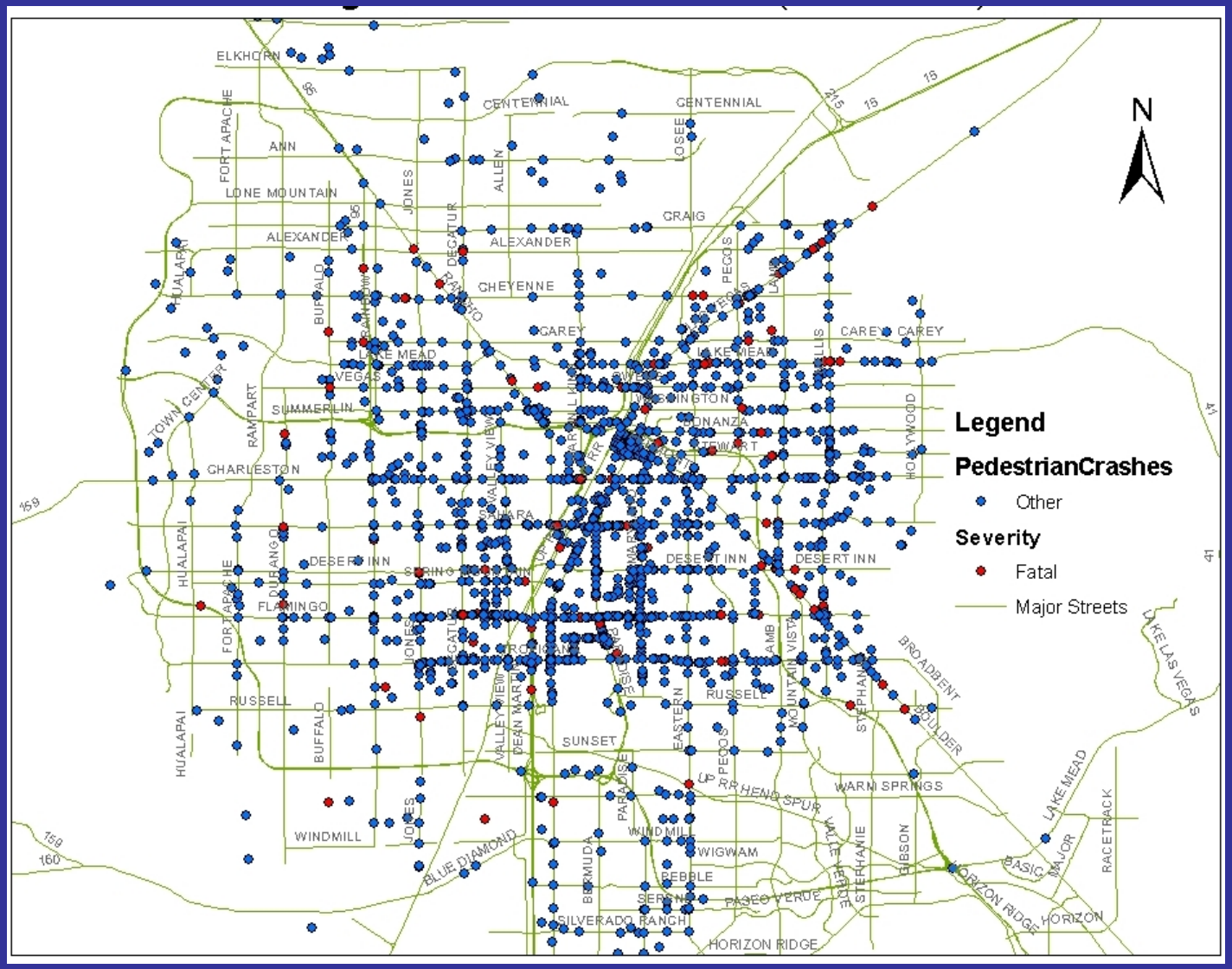
Goals

- Improve pedestrian safety, minimize risk
- Identify, develop, deploy, and evaluate countermeasures
- Case Study: Las Vegas metro area, Nevada

Introduction

- Significant growth for 20+ years
- Wide, fast street grid network
  - High posted & operational vehicle speeds
- Widely used transit system
- High risk conditions for pedestrians
- Demographics
  - Population ~ 1.8 million
  - Diversity: age, race
- 85 percent of the crashes involved locals

Pedestrian Crashes (2003 – 2006)



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Methodology

- Identify candidate locations
  - GIS based analysis
  - Site characteristics
  - Problem characteristics
- Develop, deploy, & evaluate countermeasures
  - Measures of effectiveness

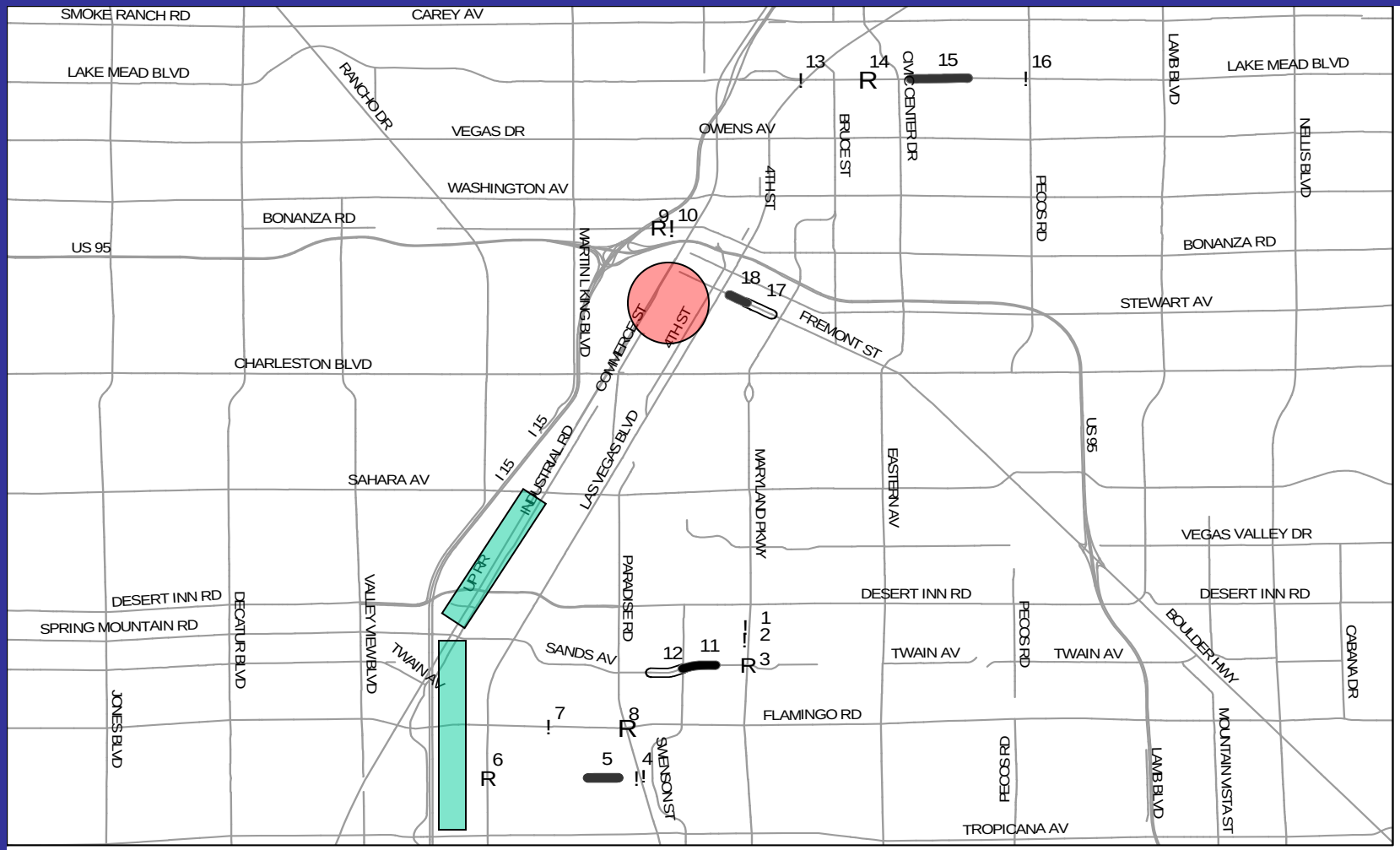
Study Design

- Before and after Studies
- Comparative studies (with control group)
- Data collection (~18,000 pedestrians)
- Statistical analyses
  - Parametric
  - Non-parametric

Study Locations

- Top priority / high risk locations
  - Crash index and crash rank
- Site selection: 18 locations
  - Includes 4 control locations
  - Excluded the resort Corridor (The “Strip” and its proximity)
- Different jurisdictions
  - City of Las Vegas
  - City of North Las Vegas
  - Clark County
  - Nevada Dept of Transportation (State)

Study Locations



0 0.35 0.7 1.4 2.1 Miles

Major Streets
! High Pedestrian Risk Locations
R Control Points

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Selection of Countermeasures

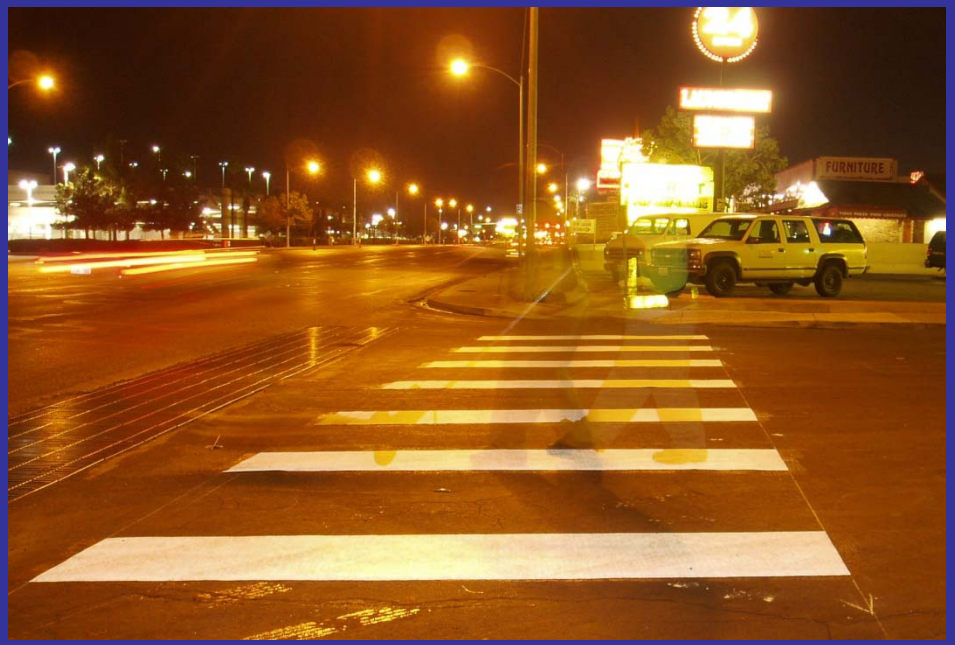
- Site characteristics
  - Geometric conditions
  - Operating conditions
  - Light conditions
  - Demographics
  - Land-use
- Costs

Countermeasures

- Engineering based countermeasures
- ITS based countermeasures
- Others

Advanced Warning Signs / Yield Markings

High Visibility Crosswalk Treatment



In-Roadway Knockdown Signs

Portable Speed Trailer

Turning Vehicles Yield to Pedestrians

Danish Offset and Median Refuge

Pedestrian Activated Flashers

Automatic Pedestrian Detection and Smart Lighting Lighting

Pedestrian Buttons that Confirm “Call” “Call”

Pedestrian Channelization

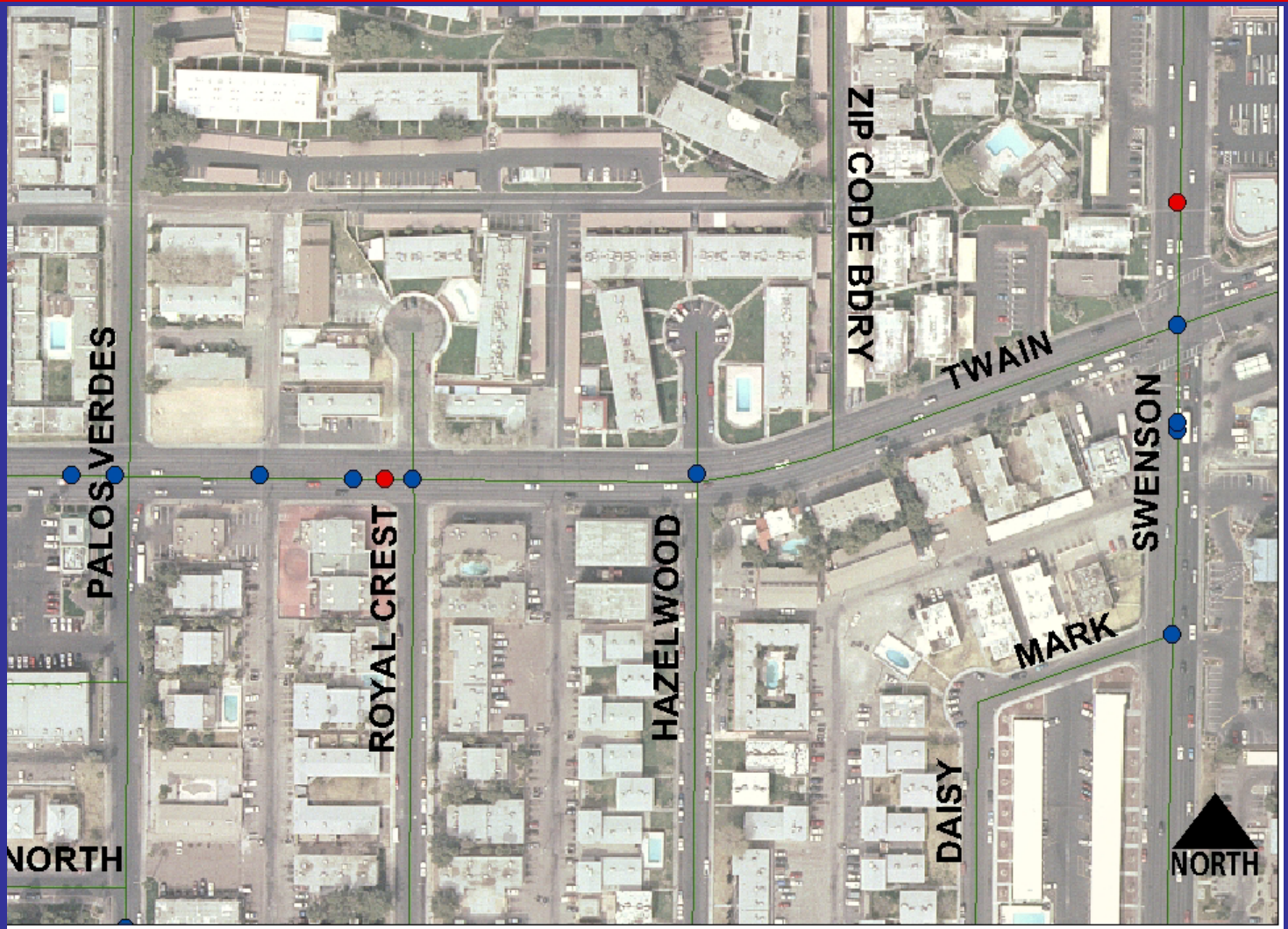
ITS No-Turn on Red Blank out Signs

Pedestrian Countdown Timers with Animated Eyes

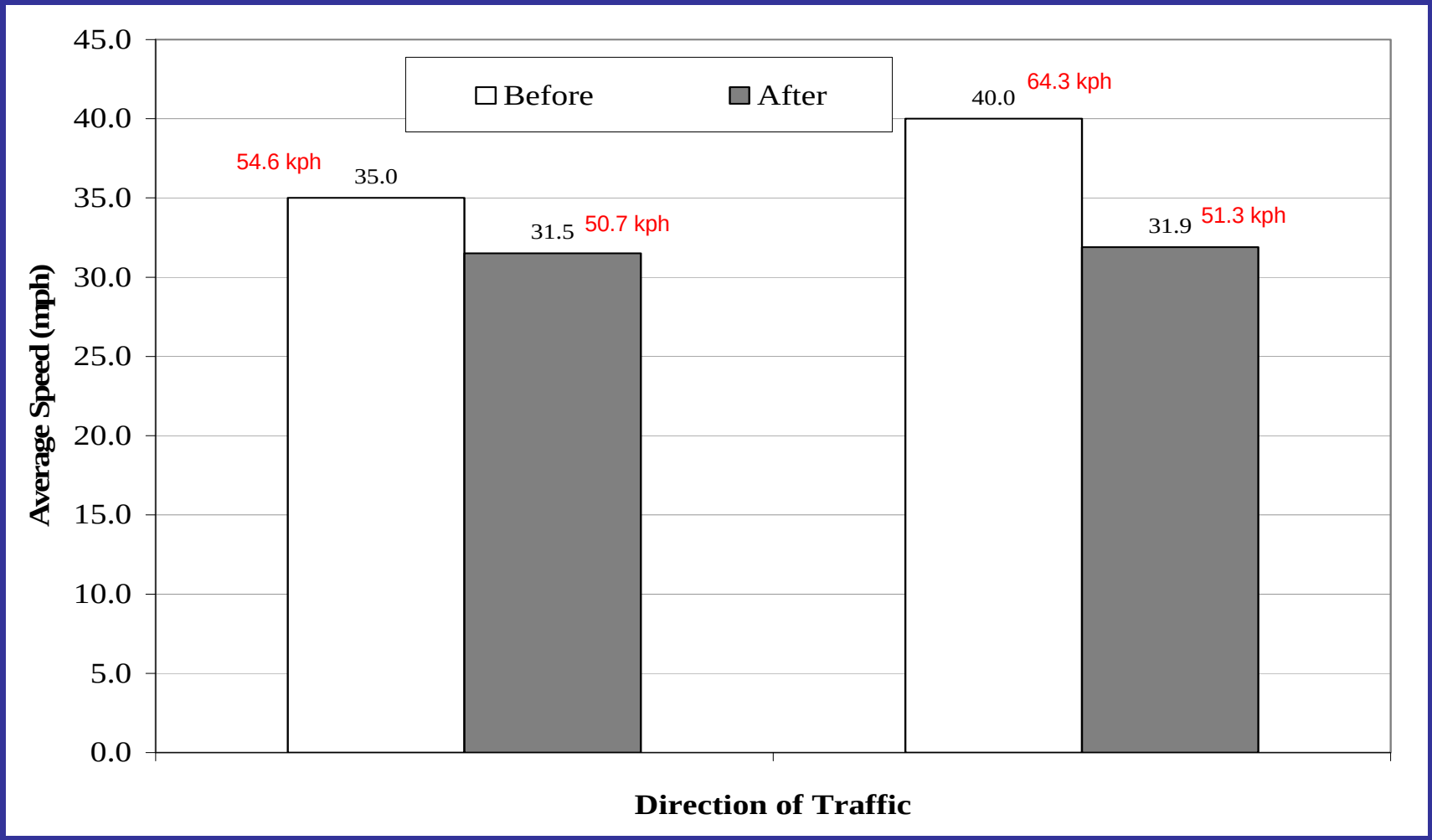
Measures of Effectiveness / Statistical Tests

- Pedestrian
  - Using the crosswalk
  - Captured / diverted
  - Looking for cars before crossing
  - Trapped in the middle of the street
  - Pedestrian-vehicle Conflicts
  - Pedestrian waiting for signal to cross
  - Delay
- Driver
  - Yielding behavior, distance
  - Blocking crosswalk
  - Speed

Speed Trailer Site Information



Speed Trailer and Vehicle Speeds



Speed Trailer: Vehicle Speeds Analysis

MOE	Baseline vs. Stage 1			Baseline vs. Stage 2		
	Delta Mean Speed	P-value	H_0	Delta Mean Speed	P-value	H_0
$H_0: V_{before} = V_{after}$ vs. $H_a: V_{after} < V_{before}$						
Eastbound mph (kmph)	5.5 (8.9)	<0.001	Reject	8.1 (13.0)	<0.001	Reject
Westbound mph (kmph)	6.5 (10.5)	<0.001	Reject	3.7 (6.0)	<0.001	Reject

Speed Trailer: Analysis of Pedestrians

(Safety) Measures of Effectiveness	Baseline	Stage 1	Stage 2
	Sample = 165	Sample = 47	Sample = 156
	Percent	Percent	Percent
% pedestrians who look for vehicles before beginning to cross	**80**	**100**	**100**
% pedestrians who look for vehicles before crossing 2nd half of street	**85**	**100**	**100**
% pedestrians trapped in the roadway	**41**	**34**	**37**

Highly Effective Countermeasures

Description	Cost
Advanced Yield Markings for Motorists	Low
In-roadway Knockdown Signs	Low
Pedestrian Countdown Signals with Animated Eyes	Medium
Danish Offset	High
Median Refuge	High
Portable Speed Trailer	High
Pedestrian Activated Flashing Yellow	High

Moderately Effective Countermeasures

Description	Cost
Pedestrian Call buttons that Confirm Call (Visible/Audible confirmation)	Low
Turning Vehicles Yield to Pedestrians	Low
ITS No-Turn on Red Signs	Medium
ITS Automatic Pedestrian Detection Devices	High

Countermeasures with Low Effectiveness

Effectiveness

Description	Cost
Warning Signs for Motorists	Low
High Visibility Crosswalk Treatment	Medium
Pedestrian Channelization	High
Smart Lighting	High

Summary

- Significant overall benefits
  - Pedestrian
  - Driver
- Permitting & deployment considerations
- Administrative / jurisdictional hurdles
- Vendor / procurement difficulties
- Education needs: pedestrians, motorists

Acknowledgments

- US Dept of Transp., Federal Highway Admin
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- Nevada Office of Traffic Safety
- Regional Transp Commission of So. Nevada
- Clark County, Nevada
- City of Las Vegas
- UNLV TRC: students, staff

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