



Investigating Electronic Work Zone Speed Limit Signs in I-35 Work Zone

Statewide Work Zone Safety Committee

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Created by Jon Ré for TEO Traffic Control Committee
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Your Destination...Our Priority



Electronic Speed Limit Signs

- ▶ ESL signs also referred to as variable legend signs
- ▶ Comprised of highly visible non-flashing LEDs
- ▶ Can be changed remotely based on operational or ambient conditions
- ▶ Permitted in the MN MUTCD



ESL Sign Utilization

- ▶ NOT dynamic speed displays or changeable message board
- ▶ Implemented on freeways as traffic management strategy
- ▶ Changed to reflect adequate driving speeds during adverse weather conditions
- ▶ Placed in work zones to accommodate changing construction conditions



ESL Signs in Work Zones

- ▶ Michigan study found ESL were more useful in “longer and simpler work zones”
- ▶ Utah study found positive results and speed restrictions that reflected actual traffic conditions builds “trust” with motorists
- ▶ Virginia study:
 - Offered little advantage when demand far exceeds roadway capacity
 - Showed benefits even at low compliance levels



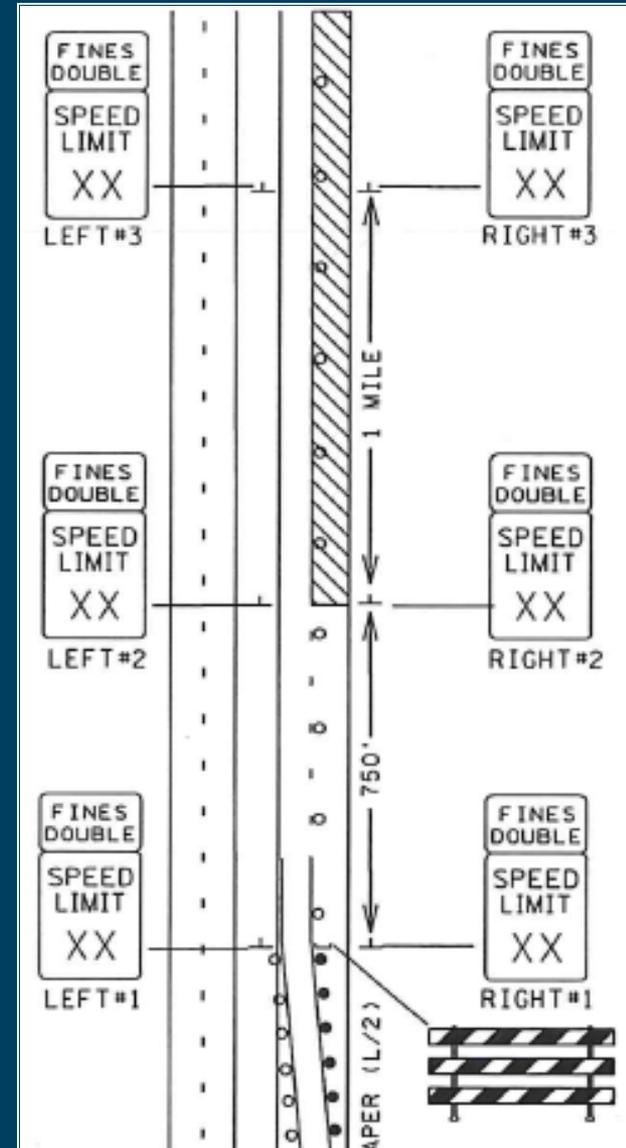
I-35 Project Details

- ▶ CPR project for 7 miles on southbound lane
- ▶ Located between TH 19 and TH 21
- ▶ Short three week project in late summer 2012



ESL Sign Application

- ▶ Placed on both sides of road
- ▶ Two sets ESL signs near entrance
- ▶ Typical one mile spacing
- ▶ 60 mph on approach and during non-construction hours
- ▶ 45 mph during construction hours and near workers
- ▶ Changed with tablet



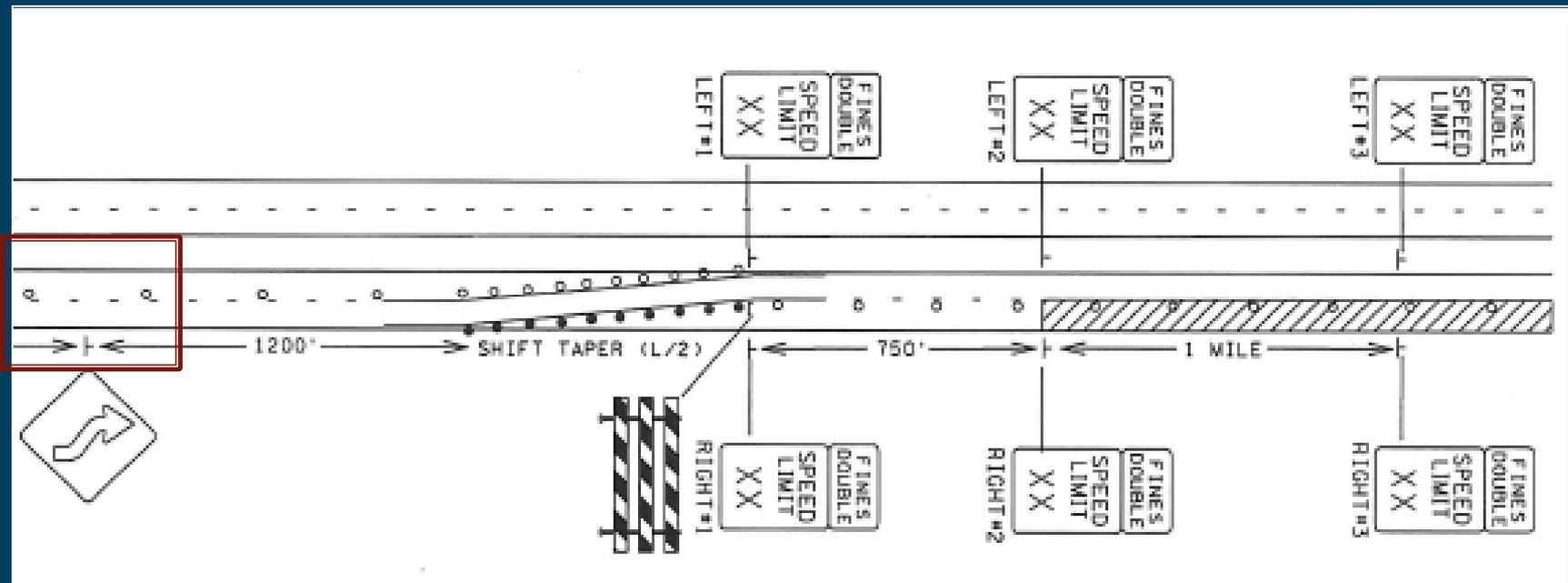
Data Collection Spot Speeds

- ▶ Used LIDAR and followed spot speed directions in Traffic Engineering Manual
- ▶ Did not separate out heavy trucks and passenger vehicles
- ▶ Collected 10 different periods with about 1,100 vehicle spot speeds
- ▶ Recorded time and worker presence



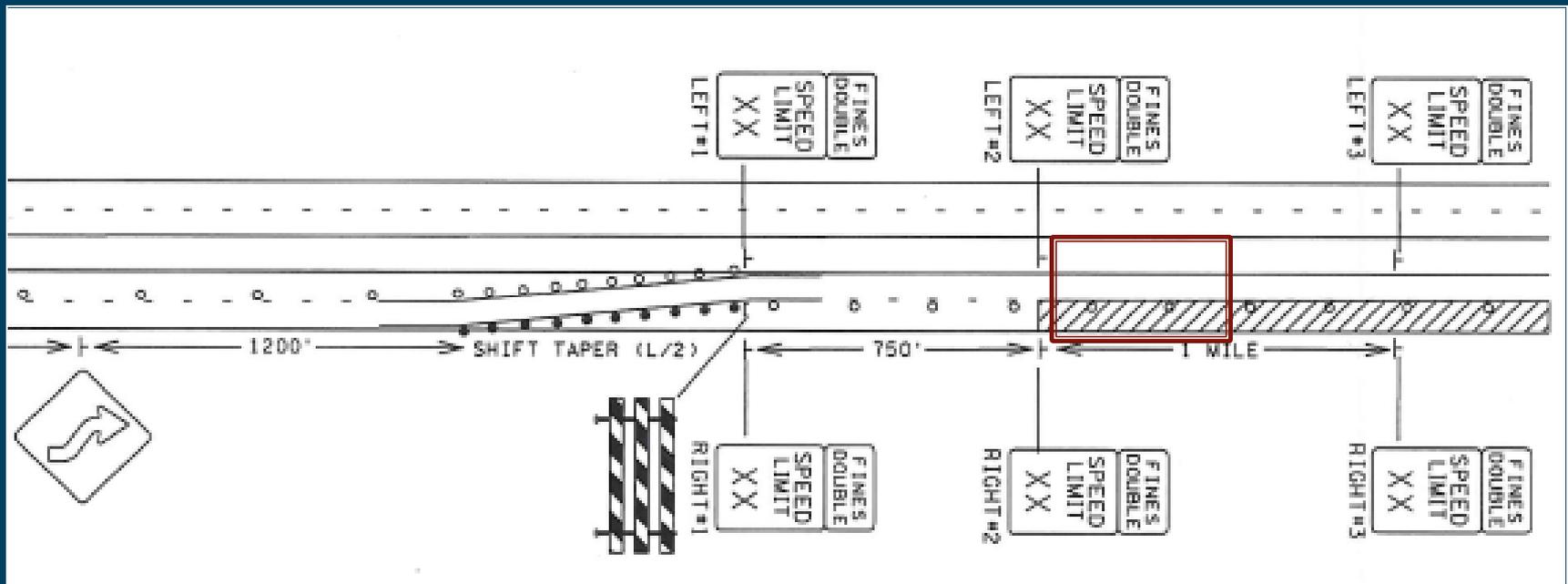
Spot Speed Locations

- ▶ Upstream: one lane travel outside of construction area with 60 mph speed limit



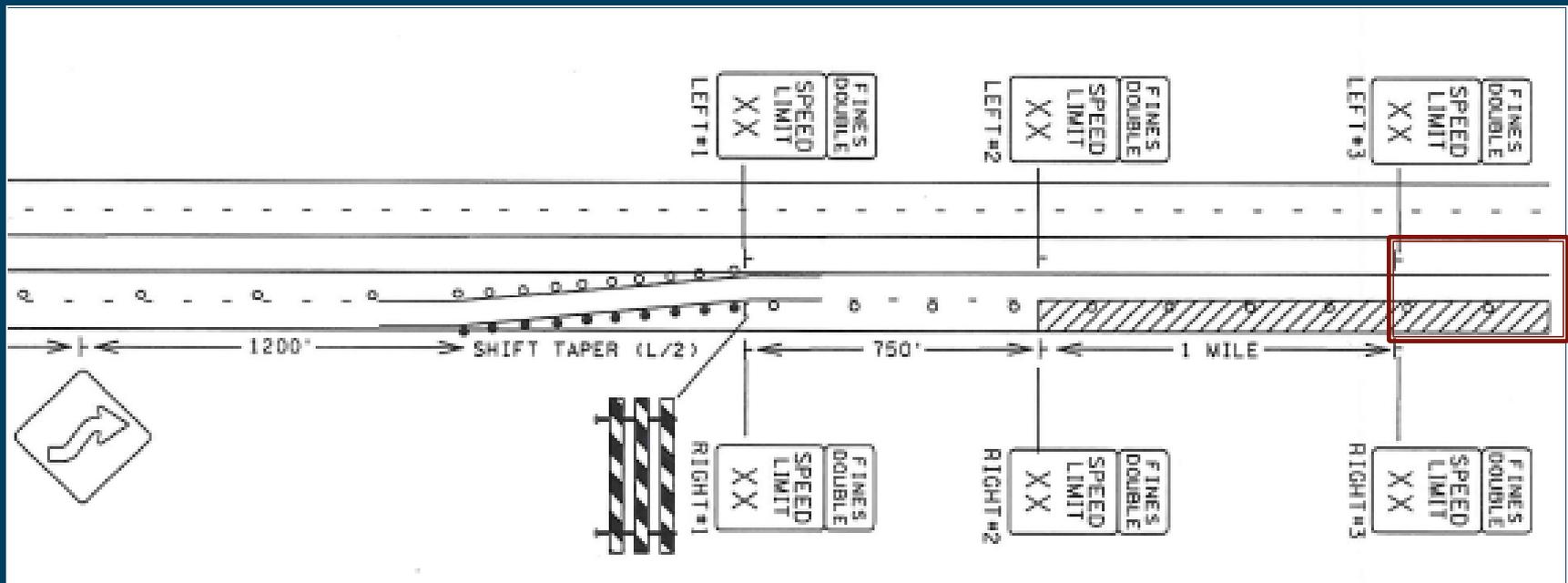
Spot Speed Locations

- ▶ Entrance: after initial two sets of ESL signs in construction area with 45 mph speed limit



Spot Speed Locations

- ▶ Downstream: 2 to 3 miles from entrance near ESL signs with 45 mph speed limit



Wavetronix Data Collection

- Assisted by the Office of Transportation Data and Analysis
- Two locations: near entrance and middle of project
- Speed and volume data provided in hourly summaries
- Categorized into Weekday, Saturday, and Sunday



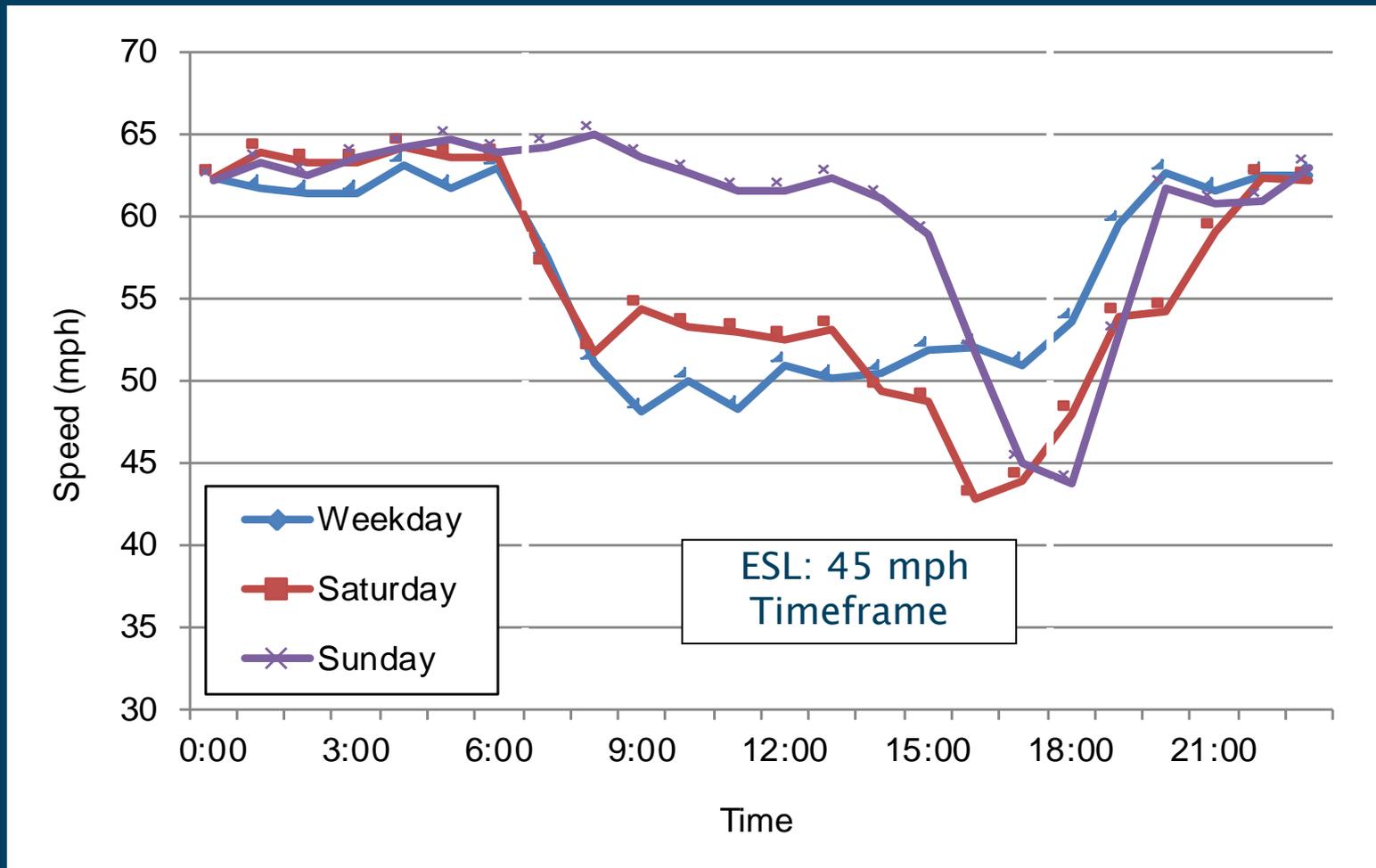
Spot Speed Table (mph)

Location	Mean	St. Dev.	85th	Min.	Max.
Upstream	59	5.8	65	44	74
Entrance	48	4.4	52	38	64
Downstream	46	3.5	49	34	60

Note: Upstream location was before the first set of ESL signs and had 60 mph



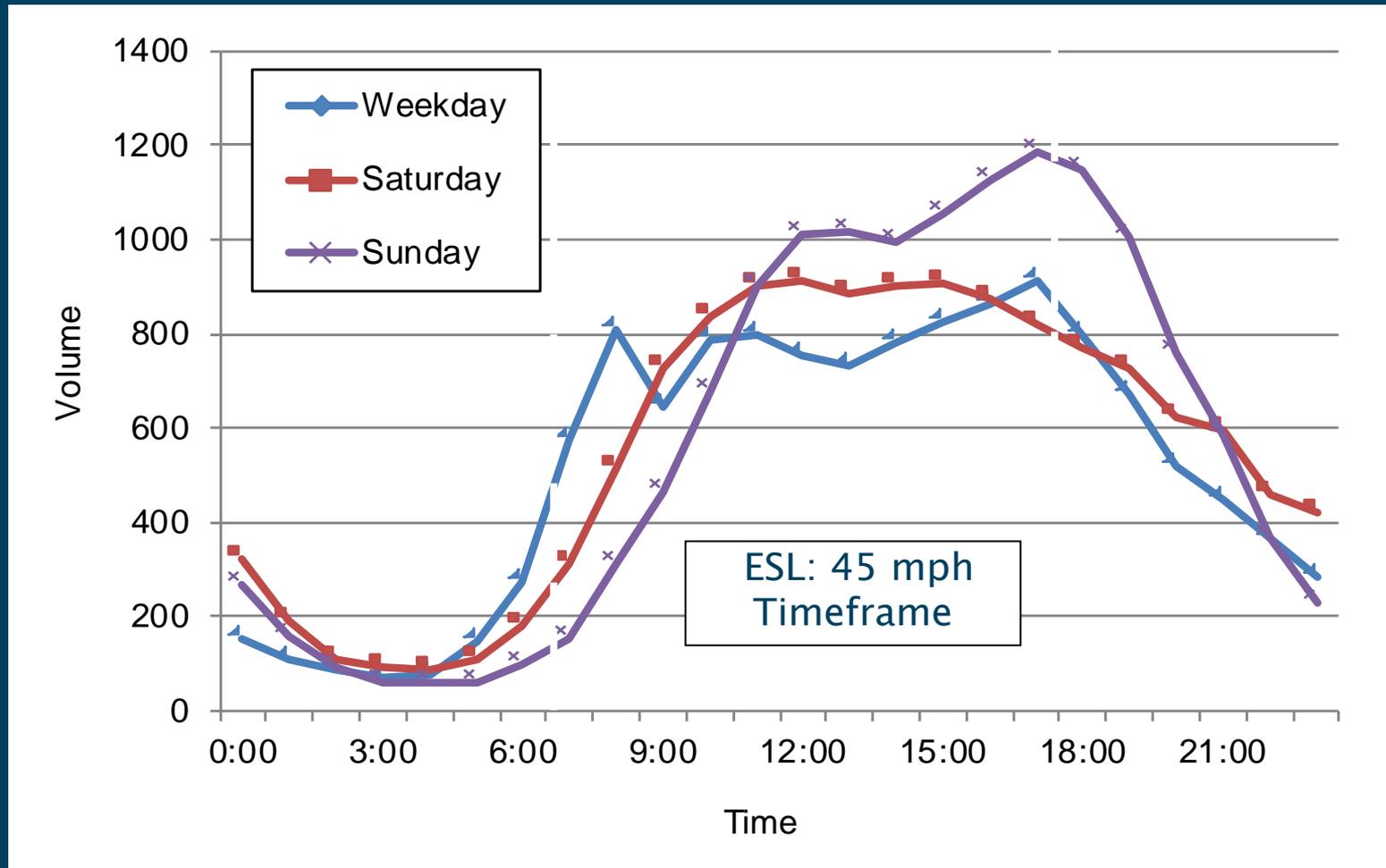
Wavetronix Mean Speed Data



Note: Sunday just had 60 mph speed limit



Hourly Vehicle Volume Data



Note: Sunday just had 60 mph speed limit



Speed Summary

- ▶ Upstream speeds were higher and exhibited more variability
- ▶ Statistically significant results between Upstream and Entrance/Downstream data
- ▶ Mean spot speed data was similar to Wavetronix speeds
- ▶ Greater vehicle platooning effect observed at the downstream location



General Outcomes

- ▶ Lower speeds and less speed variation after first set of ESL signs
- ▶ Field technicians were pleased and supportive of the ESL sign application
- ▶ ESL technology as a work zone treatment has shown *promise*



Things to Consider

- ▶ Did not have an adequate control
- ▶ A CPR project – was it the project and workers present, EWZSL, or both?
- ▶ Platooning effect by heavy trucks
- ▶ ESL signs were either 45 or 60 mph



Questions & Comments

