System Surveillance: Finding Issues Before They Become Problems

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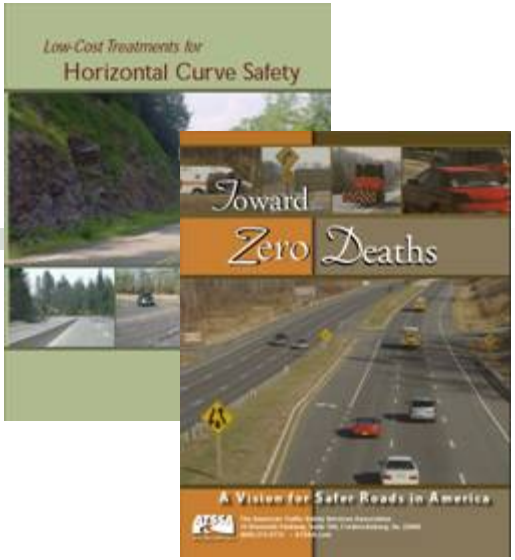
System Wide vs. Spot Application of Safety Treatments

Making our roads safer locations or location at a time!?

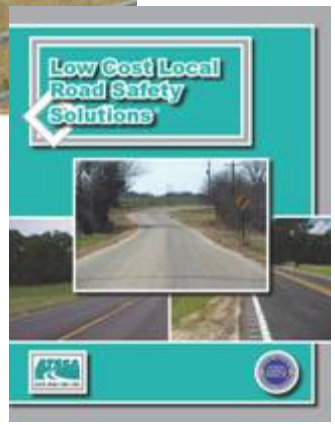
EXPLANATION

I demand one

The Network



- **We** are safety



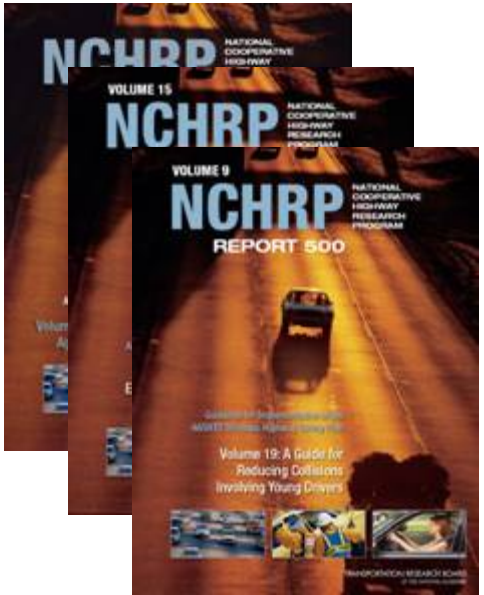
Education

Enforcement

Engineering

EMS

SAFETY

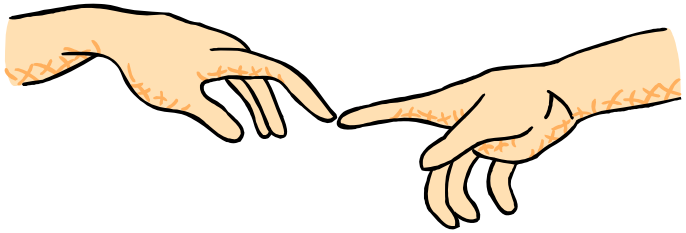


Enduring the Drive

- Each path we travel alone but together

Senses of Safety

- Seeing issues
  - Before / After
- Hearing of issues
  - Before / After
- Smelling and Tasting the issue
- Touching the issue



System Surveillance

- Transparency Report (5% report)
  - http://safety.fhwa.dot.gov/five percent/
- High Crash List
- The future
  - HSM
    - SafetyAnalyst
    - IHSDM
      - Interactive Highway Safety Design Model
- RoadSoft for Local Agencies

HSM (Highway Safety Manual)

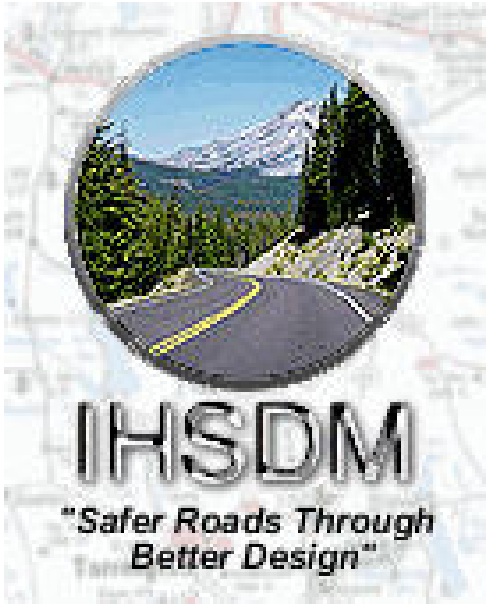
- What is it:
- Why do we need it:
- When:
- Features:

Safety Analyst

- What is it:
- Why do we need it:
  - Network Screening
  - Diagnosis and Countermeasure Selection
  - Economic Appraisal and Priority Ranking
  - Evaluation of Implemented Improvements
- When:
- Part of HSM:

IHSDM

- What is it:
- Why do we need it:
  - Part of the Design Process
    - Crash Prediction
    - Design Consistency
    - Intersection Review
    - Policy Review
    - Traffic Analysis
    - Driver/Vehicle
- When:



System Surveillance vs. Enhancements

- The location or locations have been found now what?
- Wow…..that is a lot! What are we getting back if we put this much into it?

System Wide Enhancements

- Rumble strips / stripes
- Cable Median Barrier
- Reflective Post Sheeting *(aka. Lollipops)*

Rumble Strips (Run-Off-Road Crashes)

- **National Perspective:**
  - 1/3 of ALL TRAFFIC FATALITIES
  - 2/3 Occur in RURAL AREAS
  - Every 23 Minutes, ONE FATAL ROR Crash Occurs
    - Time Reference:
      - 3 days at the conference – **188**
      - This week – **438**

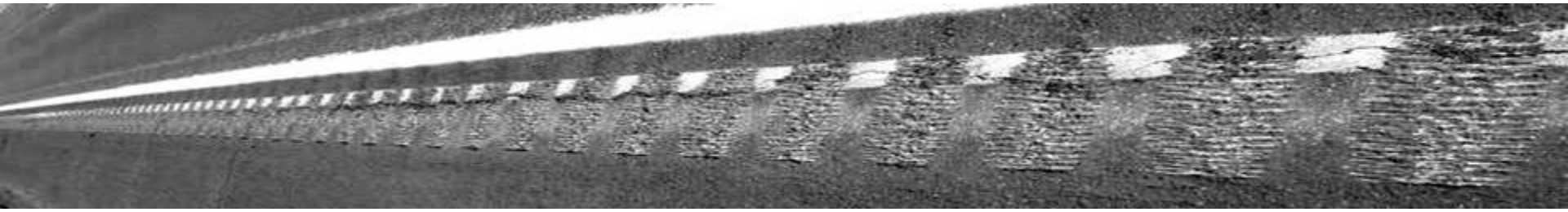
Why Rumble Strips? Why System-Wide?

- Low Cost Safety
  - Cost – around $0.20/ft or $1056.00/mile !!
  - Time Of Return – 3 months
- Proven
  - I-75 (Grayling – Gaylord)
    - 17 KA before, 1 KA after
- Crash Location is Random, Crash Type is Not

Rumble Strips (How Many Miles?)

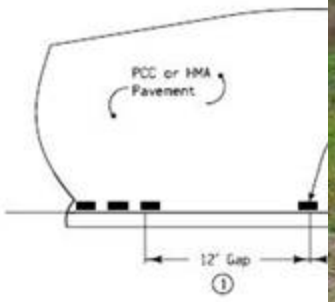
- Centerline
  - *<2007 – 7 miles*
  - *2007 - 14 miles*
  - 2008 – 1434 miles
  - 2009 – 1580 miles TBI
  - 2010 – 2432 miles TBI
  - **Total – 5467 miles**
- Shoulder
  - 2008 – 1308 miles
  - 2009 – 572 miles TBI
  - 2010 – 822 miles TBI
  - **Total – 2702 miles**
- **Total Rumbles**

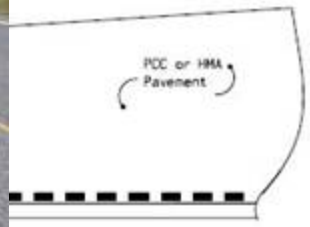
8169 Miles !!!!!

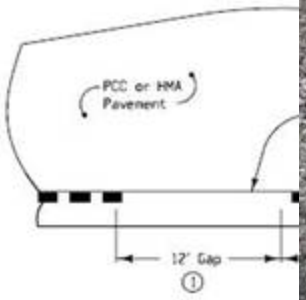


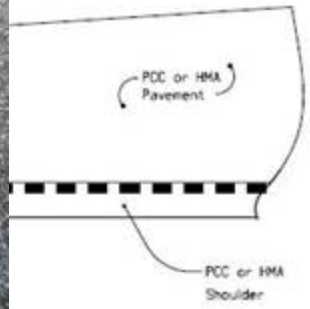
Rumble Strips (Distance Reference)

Iowa's 4" Rumble StripEs
(aka Mini-Rumbles)









Like Peanut Butter and Jelly

Cable Median Barrier

- Have been used since the 1930s or earlier
- Low vs. High Tension
- Capturing Vehicles
- 2008 Installations – being utilized already
- More for 2009, 2010

2008 Utilization of the Cable Median Barrier

Cable Median Barrier

Cable Median Barrier

Cable Median Barrier

Median Cable Barrier Installations in Michigan

2008 Projects

1. I-69 from M-13 to Elms Road (Completed)
2. I-94 from the Wayne/Washtenaw County Line to Hannan Road
3. I-94 from Friday Road to the Van Buren/Kalamazoo County Line
4. I-96 from M-66 to the Ionia/Clinton County Line
5. US-131 from the Kent/Allegan County Line to 76th Street

2009 Projects

6. I-69 in Shiawassee County
7. I-75 from Portage Street to the Mackinac/Chippewa County Line
8. I-94 from the Kalamazoo/Van Buren County Line to 12th Street
9. I-96 from M-104 to the Ottawa/Kent County Line
10. I-275 from M-153 (Ford Road) to the I-696/I-96/M-5 Interchange
11. US-23 in Monroe County
12. US-131 from B Avenue to 146th Avenue

2010 Projects

13. I-94 from US-12 to I-94 Business Loop
14. I-94 from Columbia Avenue to 17 Mile Road
15. I-96 from US-131 to the Kent/Ionia County Line
16. I-196 from 71st Street to 118th Avenue
17. US-23 from M-36 to the Livingston/Genesee County Line
18. US-131 from Three Rivers to M-216

Reflective Post Sheeting (Lollipops)

- ~$35 per post (material)
- Enhancing Sign Visibility
- Floating Sign Effect

Reflective Post Sheeting (Lollipops)

Time for a Scary Safety Picture

Spot Enhancements

- Operational
  - Approach Rumble Strips
  - Ground Mounted Flashing beacons
  - Wet/Night Pavement Markings
- Geometric Enhancements
  - Offset Right-Turn Lanes
  - Roundabouts

Approach Rumble Strips

Ground Mounted Flashing Beacons

Wet/Night Pavement Markings

- Metro Region

Time for Another Scary Safety Picture

Offset Right-Turn Lane

Roundabout

Websites:

Roundabouts an Informational Guide: http://www.tfhrc.gov/safety/00068.htm

http://www.roundaboutsusa.com/

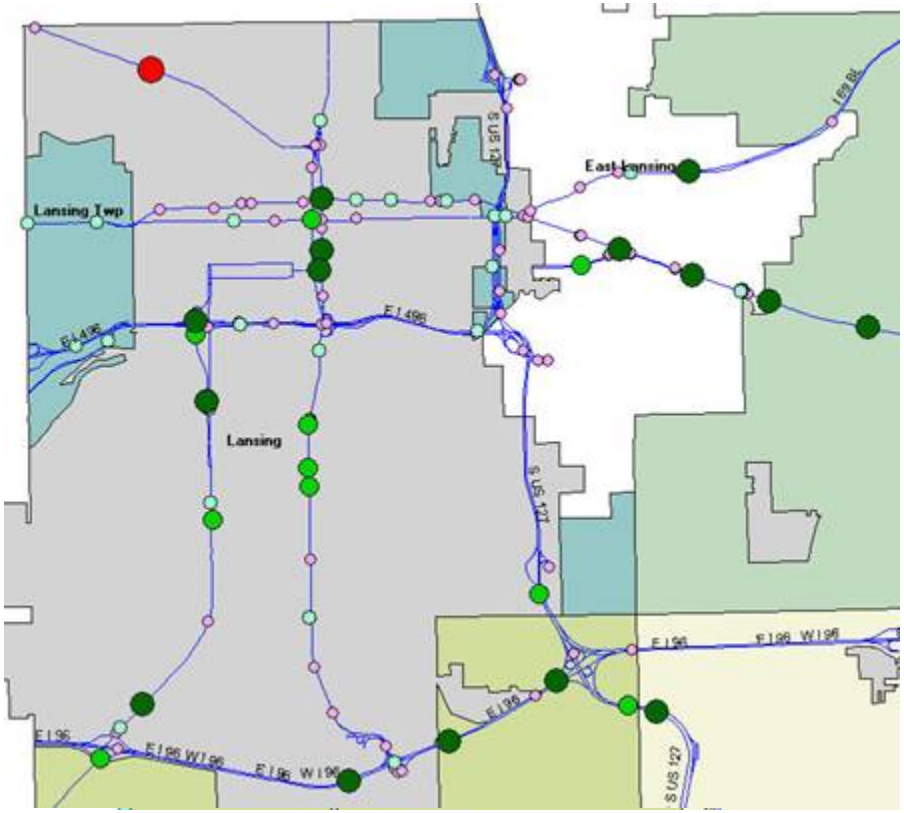
Time for Scary Safety Pictures

LIFT
FIRE
ALARM
FOR HELP
1. PUSH RED BUTTON
2. OR YELL
widelec.org

YOUR SPEED
km
h
HIGHSCORE
Streetstyle 71
Blade 93
DarkMark 98
Streetstyle 106
Blade 120
Streetstyle 132
DarkMark 134
148

Targeted Enforcement

- RoadSoft
  - Aggressive Driving
  - Alcohol
  - Commercial Vehicles
  - Young Drivers
  - Weather Conditions



Targeted Education

- **NCHRP 500 Volume 9:** *A Guide for Reducing Collisions Involving Older Drivers*
- **NHCRP 500 Volume 11:** *A Guide for Increasing Seatbelt Use*
- **NCHRP 500 Volume 19:** *A Guide for Reducing Collisions Involving Young Drivers*
- **NCHRP 500 Volume 21:** *Safety Data and Analysis in Developing Emphasis Area Plans*

MOTIVATION

If there is a better reason to paddle, I don't know what it is.

Time for Something Completely Different

Steven Seagal Emotion Chart
Happy
Sad
Petulant
Lonely
Amused
Skeptical
Furious
Wistful
Confused
Bored
Sarcastic
Regretful
Aroused
Terrified
Proud
Mischievous

Identifying Problem Areas

- Local knowledge
- Local history
- 5 % Report
  - Statewide search
  - High severity crashes

M-59/Bullard Background

- M-59/Bullard intersection
- Hartland Township-Livingston Co.
- M-59 Boulevard Section
- Full access intersection at Bullard

M-59/Bullard Crash Analysis

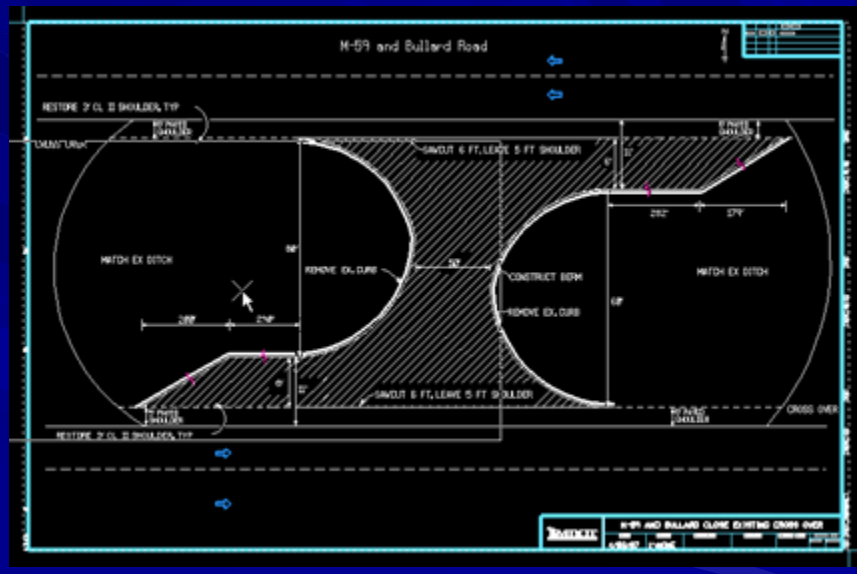
- High Priority on 5 % Report
- 6 total crashes
- 4 Angle type crashes
- 5 fatalities and 1 serious injury

M-59/Bullard
Identifying the Cause

- Speeds on M-59
- Drivers crossing M-59
- Drivers turning left onto M-59

M-59/Bullard Treatments

- Increased speed enforcement
- Closed median opening
- Eliminate problem movements
- Indirect movements provided by turnarounds
- Approx. $25k
- Time of Return = 0.18



M-59/Bullard
“After” Crash Analysis

- Just over one year of data

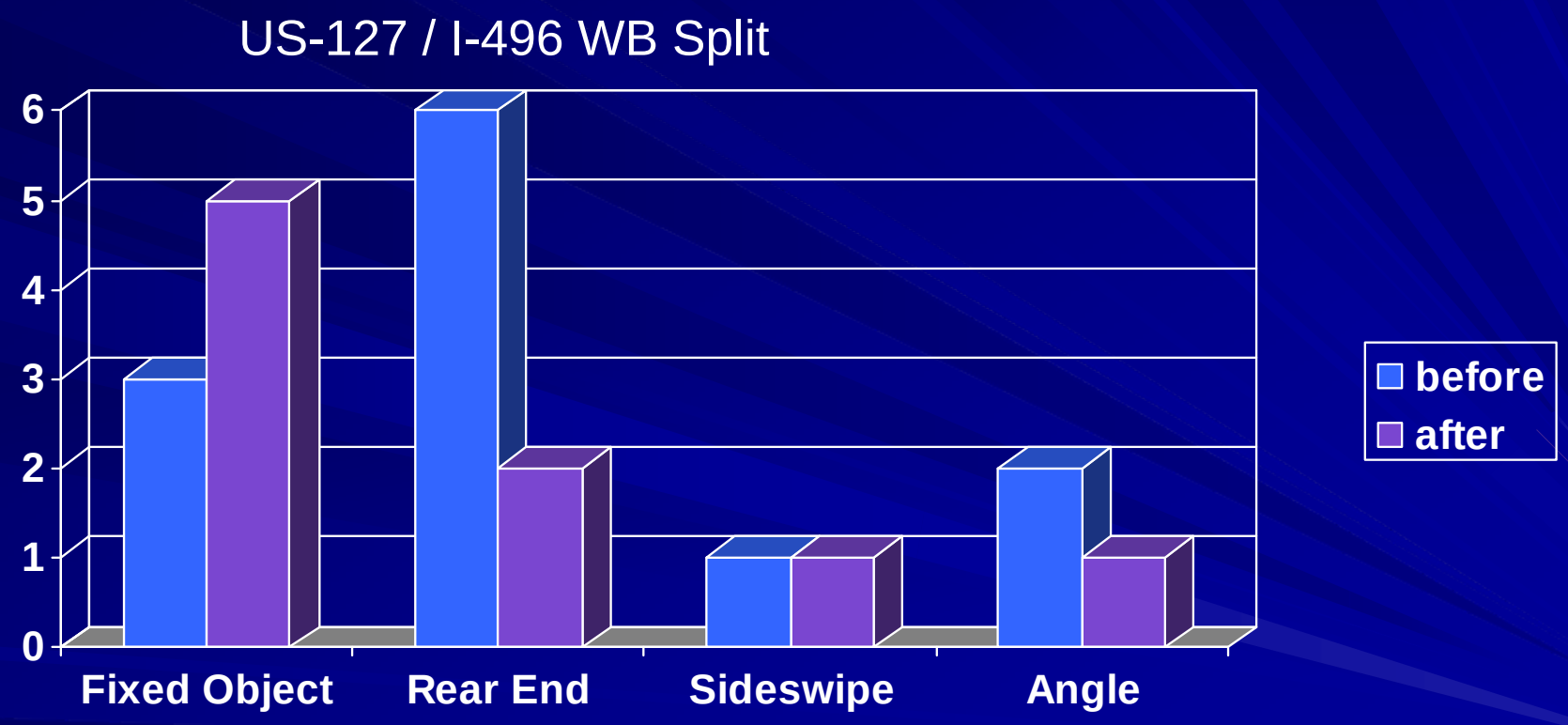
- So Far…
  - 1 deer crash

US-127/I-496/Trowbridge Road

US-127/I-496/Trowbridge Road Background

- Participants
  - Michigan State Police
  - East Lansing Police Department
  - MDOT Traffic and Safety
  - MDOT Lansing TSC
- Changes Spring 2007
  - Advance signing changed
  - Speed limit raised to 70 mph

US-127/I-496/Trowbridge Road Crash Data



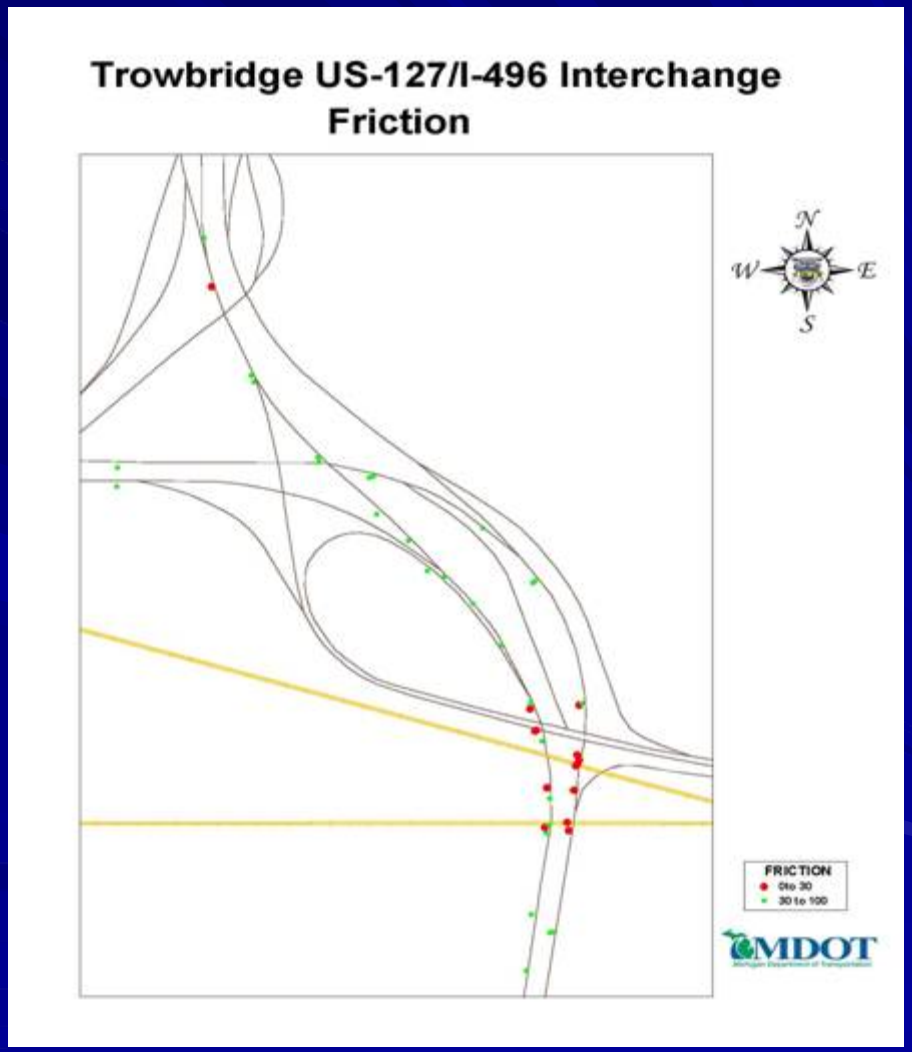
Data before and after speed limit change on 4-2-2007

US-127/I-496/Trowbridge Road Crash Analysis

- Rear-end, Sideswipe, and Angle decreased
- Fixed Object increased
- Low Friction Numbers for Area

US-127/I-496/Trowbridge Road 2006 MDOT Friction Numbers

- Red Dot = Low Friction numbers
- Could lead to more wet crashes & fixed object crashes



US-127/I-496/Trowbridge Road MSP Friction Numbers

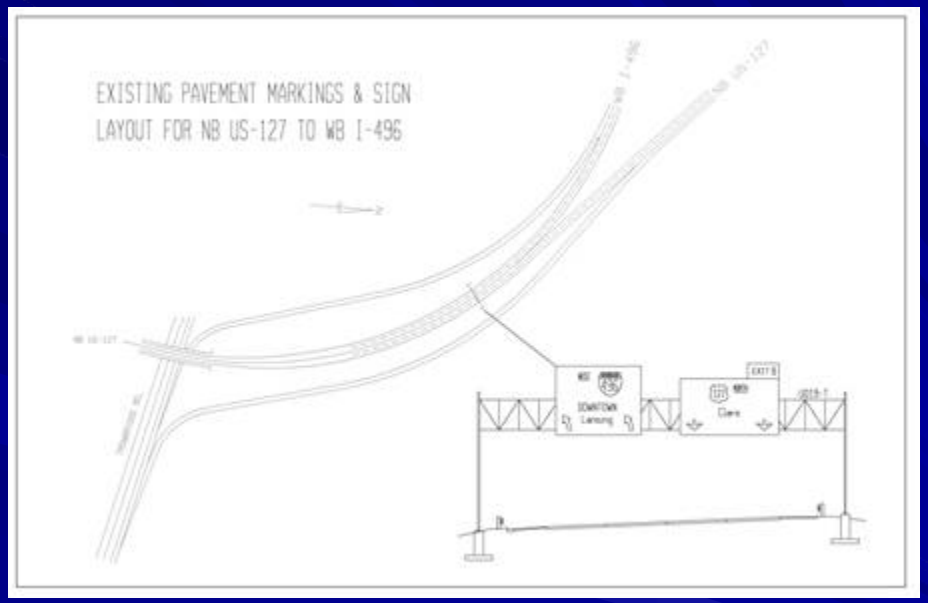
- Dry Reading = 0.90
- Wet Reading = 0.49
- 46 % reduction for wet pavement

US-127/I-496/Trowbridge Road Treatment for Low Friction

- Fall 2008- Applied flood coating to bridge decks
- Approximate cost = $50k
- MSP “After” Friction Numbers
  - Dry Reading = 0.96
  - Wet Reading = 0.91
  - Reduction of 5% for wet pavement

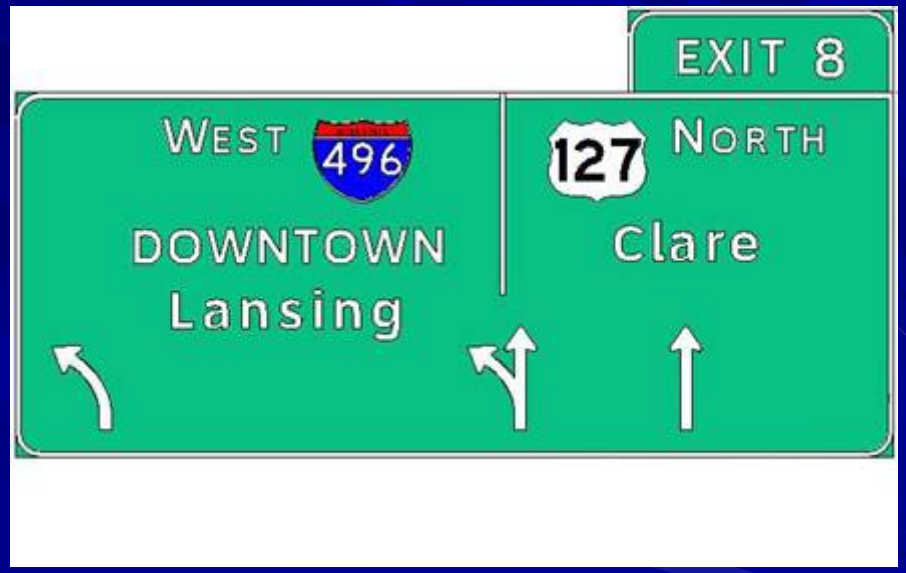
US-127/I-496/Trowbridge Road Lane Configuration at Split

- 4 lanes NB
  - 2 lanes splitting to WB on I-496
  - 2 lanes going north on US-127



US-127/I-496/Trowbridge Road New Lane Configuration at Split

- 3 lanes NB
  - Left lane to WB I-496 only
  - Center lane shared thru/left
  - Right lane NB US-127 only



- Cost approx $18k

Summary

- More proactive in finding problems
- Sometimes there are fast, low-cost solutions

Signal Optimization on the Local Road Network

Signal Retiming

- Aims to Reduce Travel Times, Delays and Frequency of Stops
- Improves Safety, mobility and Reduces Fuel Consumption and Emissions
- Improvements Typically Show a Benefit to Cost Ratio for Signal Retiming of ~20:1 but Can Be Much Higher

Status

- MDOT has Optimized Over 2000 Signals Statewide (Trunkline)
- Based on Current reduced Budget, MDOT Will Complete Optimization in the Next 5 years for a Grand Total of...

~3100 Signals

- Thousands of Signals Exist on Non-Trunkline
- Oakland County and the City of Grand Rapids are Performing Their Own Optimization Projects.

Project Request

- Federal Funds Can Be Used Through Safety Programs to Optimize Signals
- 80/20 Local Matching Funds
- Complete MDOT Form 1627 to Apply for Funds
- Time of Return and Crash Data (Including UD-10 Reports) is Needed Among Other Information

Project Request

- Force Account (Submit Bills for Reimbursement)
- Due Date for the Current Call (FY 2010 & FY 2011) is…

March 27, 2009

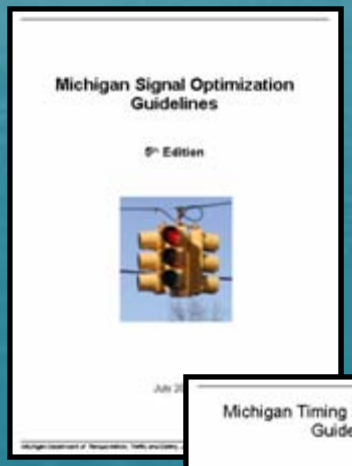
- Contact Jim D'Lamater at

  517-335-2224 or dlamaterj@michigan.gov
- Informational Website on submitting projects at

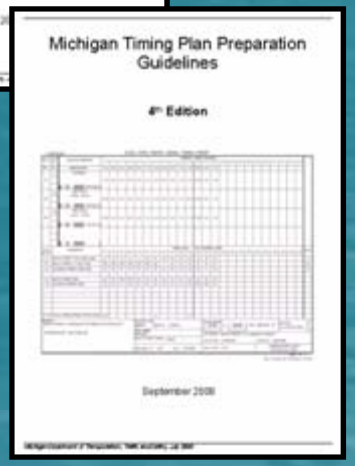
http://www.michigan.gov/mdot/0,1607,7-151-9625_25885_40552---,00.html

New Tools

- Consultant Prequalification Category Specifically Developed for Signal Optimization (Not Required on Local Roads)



- Michigan Signal Optimization Guidelines (5th edition)
- Michigan Timing Plan Preparation Guidelines (4th edition)



Located at:

http://mdotwas1.mdot.state.mi.us/public/tands/plans.cfm

The Process

Data Collection

- Posted Speed Limits
- Volumes
  - 8 hr Turning Movement
  - 24 hr Machine
- Geometry

The Process

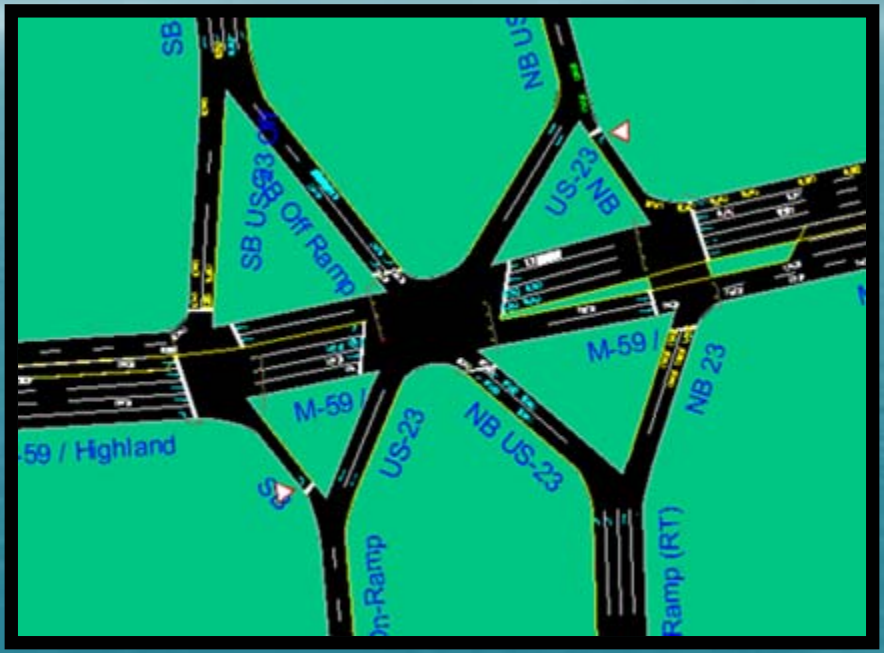
Data Collection, cont…

- Existing Signal Operations
- Crash Analysis
- Corridor Travel Times
- Special Issues
  - Schools
  - Factories
  - Special Events, Large Traffic Generators, etc…

Model Existing Operation

Set up Synchro Model

- Use Existing
  - Volumes
  - Geometry
  - Signal Operations
- Base Line for Optimization
- Calibrated to Field Conditions
  - Critical Step To Get Good Results

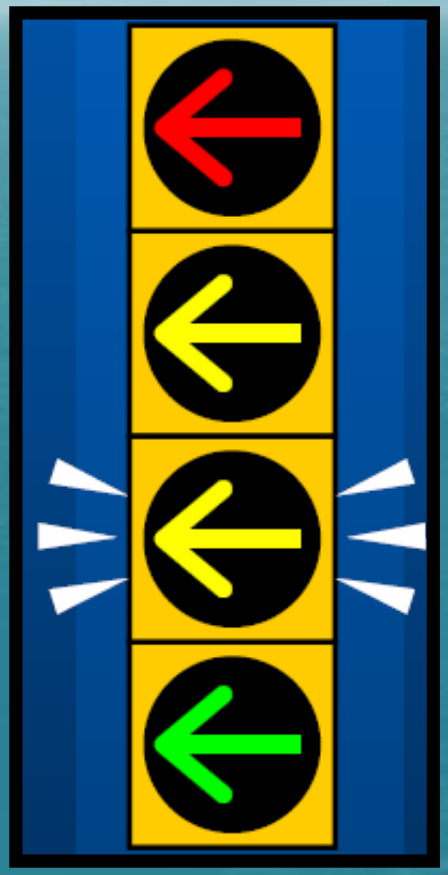


Phasing

Generally Phasing Does Not Change

Except When...

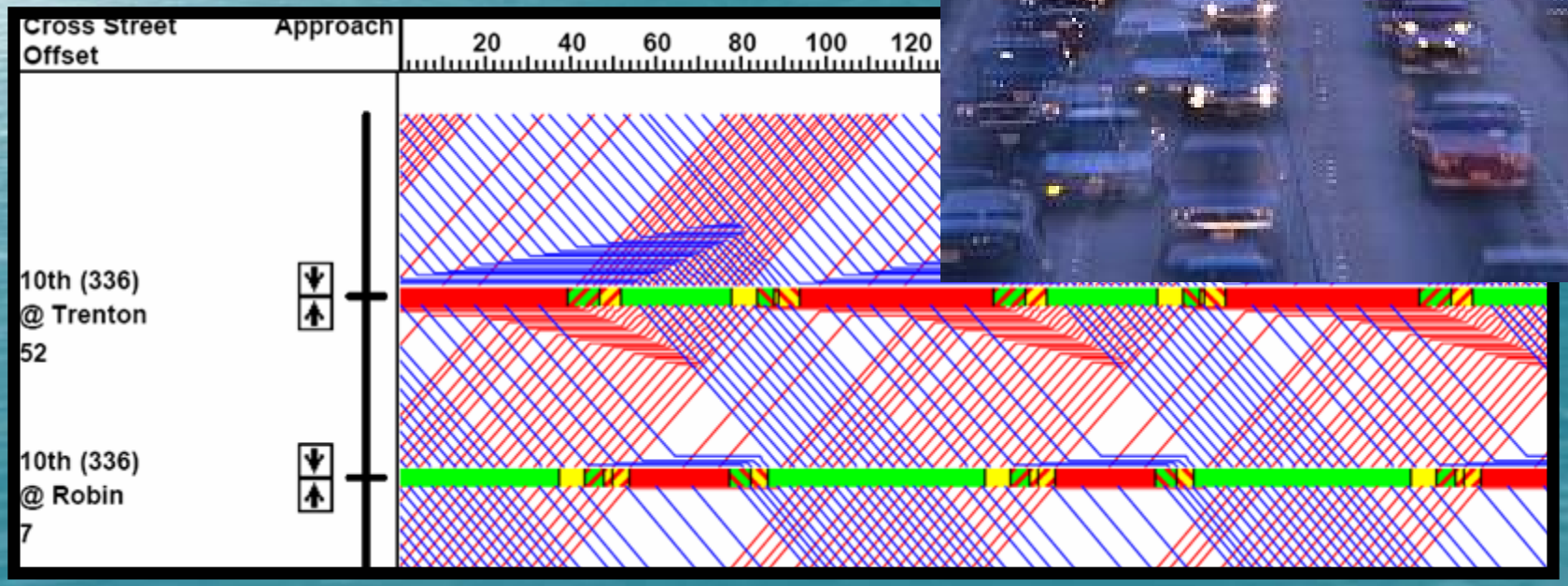
- Major Improvement Can Be Achieved
- Existing Phasing Violates MMUTCD



Measures of Effectiveness

Primary MOE's

- Vehicle Delay
- Progression Bandwidth



Time of Day Schedules

Typically Set Up 3 Timing Plans

- Morning Peak, PM Peak, Off Peak (Noon Hour)

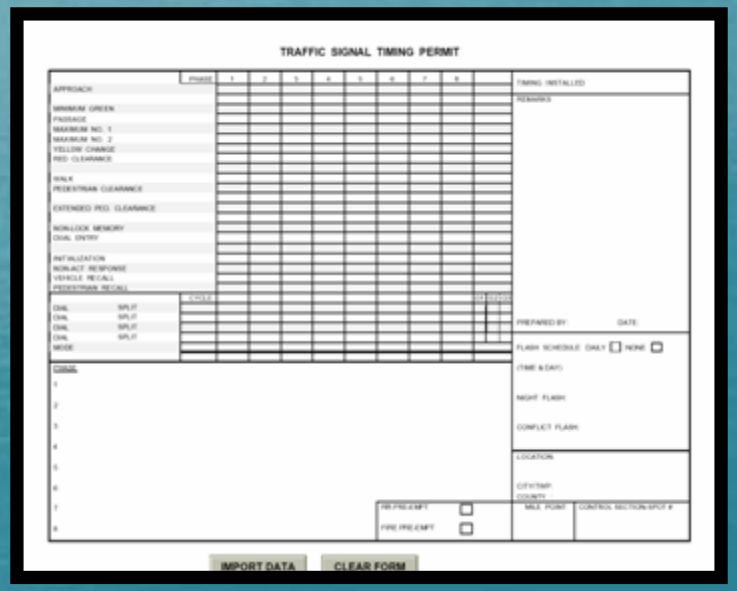
Flash Schedule

Other Timing Plans Can Be Included If Needed

- School Plan
- Special Event Plan
- Emergency Plan
- Holiday Plan
- Nighttime (If No Flash Schedule Exists)

Timing Permits

Consultant Generates New Timing Permits



Region Electrician or Maintaining Agency

Does the Actual Field Installation

(Only People Allowed in Controller Cabinet)

Field Review

Models are NOT Reality

Consultants Field Review Operations

Is Timing Installed As Called For?

Are Traffic Delays and Backups Similar to What Was Modeled?

Before/After Travel Time Runs If Needed

Recommend Minor Adjustments

Final Report

- MOE's
- Benefit to Cost Ratio
- Identify
  - Deficiencies
  - Potential Improvements
  - Potential Safety Projects

Final Report - cont...

Provide

- Volume Data
- Crash Data
- Synchro Models
- Final Timing Permits as Installed
- Inventory Sheets

Good Stuff for Future Reference

Benefits of Retiming

<u>Reduced</u>

Delay

Stops

Driver Frustration

Pollution

Benefits of Retiming – cont…

Anticipated Safety Benefits

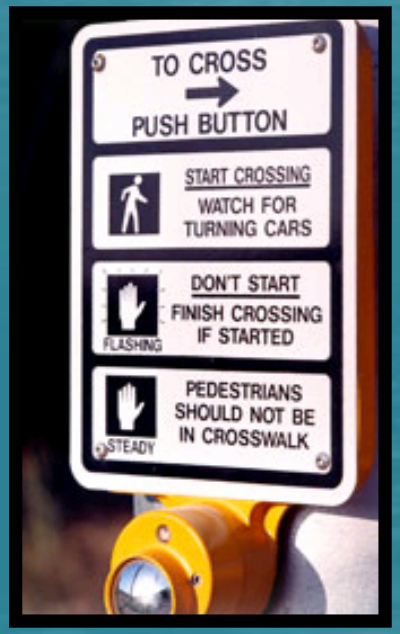
- Reduced Angle and Rear-End Crashes

Updates to Current Clearance Intervals

- Smoother Flow
- Reduced Queues

Identifies Beneficial Physical Upgrades

- Turn Lanes
- Vehicular Actuation
- Pedestrian Push-Buttons
- Controller Upgrades



Benefit to Cost Ratio

Very Conservative Assumptions

- 1 Year Time Frame
- Weekdays Only
- Peak Periods Only
- Emissions Not Included
- Uses Travel Time Runs - Not Projections
- Conservative Numbers Used to Avoid Debate

Well-Timed Corridors May Experience Lower B/C Ratio

- Updated with New Standards

Example Benefit/Cost Ratios

- M-59 in Macomb County
  - 46 Signals
  - Vehicle Hours of Travel: Down 1108 hrs/day
  - Fuel Consumption: Down 250 gallons/day
  - Emissions: Down 1,786 lbs/day
  - B/C ratio: 22 to 1

MDOT's Participation

MDOT Is Willing...

...to Help Local Agencies Perform Technical Reviews of Optimization Projects Whether They Are Funded Through Safety Funds or On Their Own Budget

...to Perform Some of the Optimization Duties on a Limited Scale, If No Funding is Available

Contact MDOT

Jason Firman, P.E.
Congestion & Mobility
517-636-0299
firmanj@michigan.gov