LOCAL ROAD SAFETY PLANS

LAURA SLUSHER, PE

HELPERS Program Manager / Traffic Safety Engineer

December 4, 2019

INDIANA LOCAL TECHNICAL ASSISTANCE PROGRAM

INLTAP

- Training
- Technical Assistance
- Resources
- Publications
- Research
- HELPERS
  - *Roadway Safety*

HELPERS

HELP LOCAL AGENCIES REDUCE THE NUMBER AND SEVERITY OF CRASHES ON THEIR ROADS

HELPERS

- Safety Investigations
- Road Safety Audits
- Roadway Safety Improvements
- Safety Funding Application Assistance
- Crash Data Analysis
- Roadway Safety Training

HELPERS

- Safety Investigations
- Road Safety Audits
- Roadway Safety Improvements
- Safety Funding Application Assistance
- Crash Data Analysis
- Roadway Safety Training

MONTGOMERY COUNTY

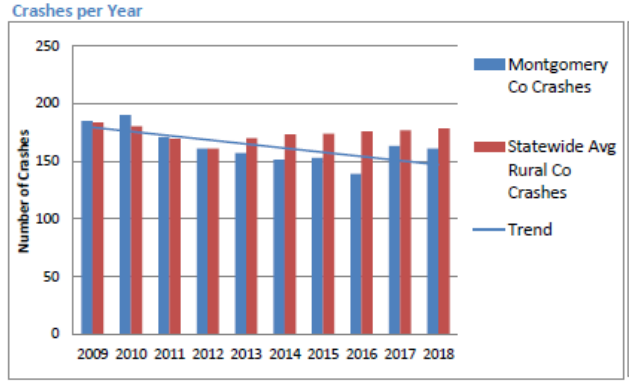
Total Crashes per Mile per 10 years: 2.0

Most Crashes/Mile Rank among Rural Counties: 42 (of 66)

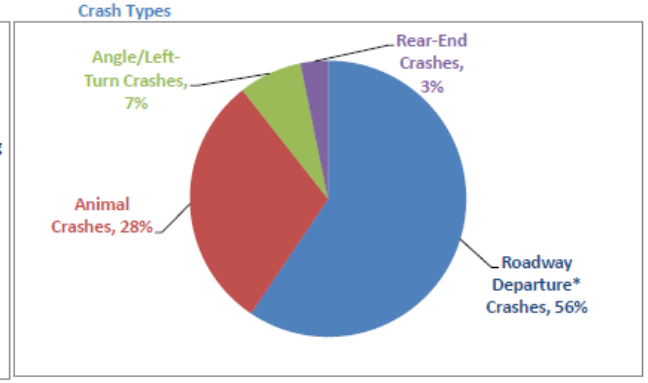
	Total Crashes	% Crashes	Rural County Average	Number of Crashes per Year									
				2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Total Crashes	**1631**	-	-	185	190	171	161	157	151	153	139	163	161
Fatal Crashes	**13**	0.80%	*0.77%*	3	1	1	0	0	0	2	0	1	5
Injury Crashes	**283**	17%	*18%*	29	37	23	30	38	24	23	24	27	28
Roadway Departure* Crashes	**913**	56%	*53%*	111	114	85	94	80	93	87	90	80	79
Animal Crashes	**460**	28%	*31%*	50	51	59	48	57	36	44	33	47	35
Angle/Left-Turn Crashes	**114**	7%	*8%*	8	9	9	8	13	15	9	8	18	17
Rear-End Crashes	**49**	3%	*3%*	8	7	3	4	3	3	2	5	7	7
Dark Roadway Crashes	**772**	47%	*51%*	87	87	77	81	72	70	73	72	86	67
Wet Roadway Crashes	**554**	34%	*32%*	75	78	48	53	47	57	57	49	39	51
Horizontal Curve Crashes	**314**	19%	*22%*	32	38	28	29	39	30	28	22	31	37
Intersection Crashes	**325**	20%	*22%*	30	23	31	16	25	39	37	32	43	49
Gravel Roadway Crashes	**137**	8%	*7%*	12	20	15	13	13	11	10	16	14	13

**includes Run Off Road, Head-On and Sideswipe Crashes*

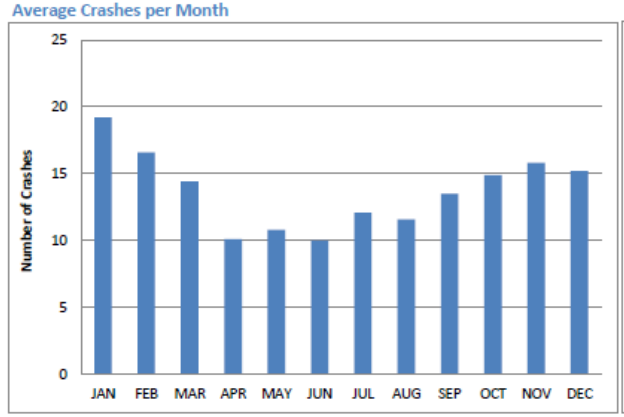
Crashes per Year



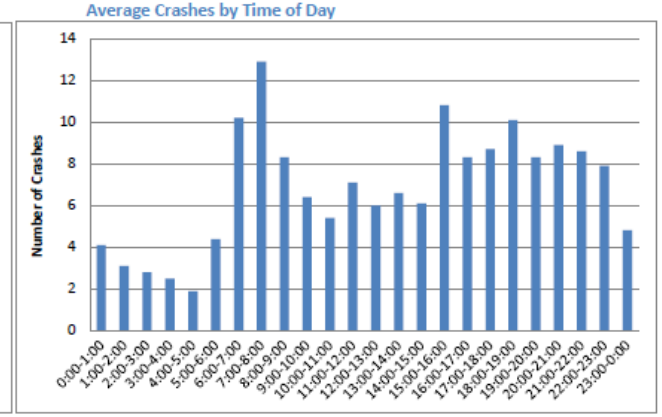
Crash Types

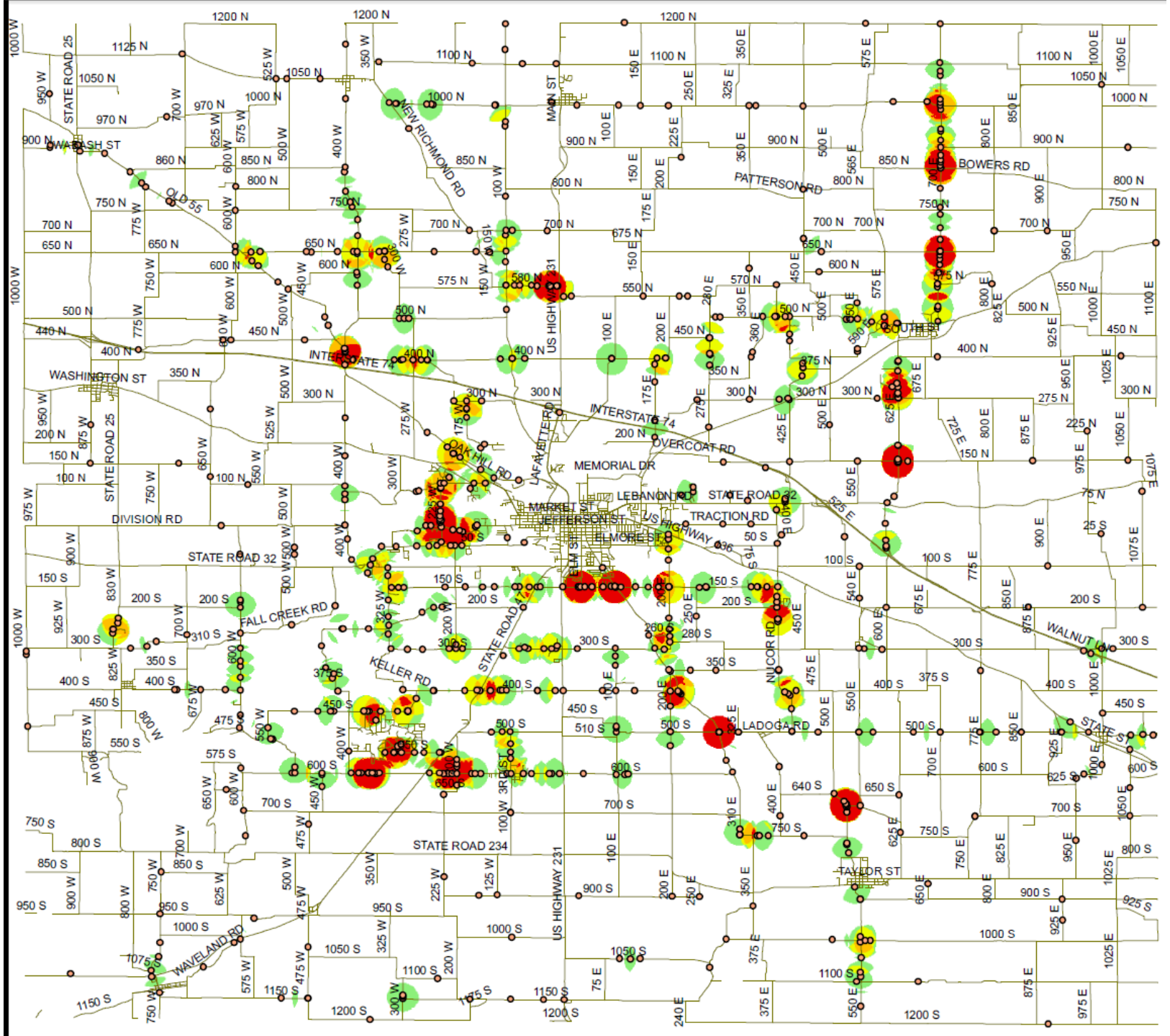


Average Crashes per Month



Average Crashes by Time of Day




STATE ROAD 25
WABASH ST
OLD 55
NEW RICHMOND RD
MAIN ST
US HIGHWAY 231
INTERSTATE 74
WASHINGTON ST
OAK HILL RD
LAFAYETTE RD
MEMORIAL DR
MARKET ST
JEFFERSON ST
ELMORE ST
ELM ST
LEBANON RD
STATE ROAD 32
TRACTION RD
US HIGHWAY 136
OVERCOAT RD
PATTERSON RD
BOWERS RD
DIVISION RD
FALL CREEK RD
KELLER RD
STATE ROAD 47
3RD ST
NUCOR RD
LADOGA RD
WALNUT LN
STATE ROAD 234
TAYLOR ST
WAVELAND RD

INDIANA CRASH STATISTICS

In 2017,

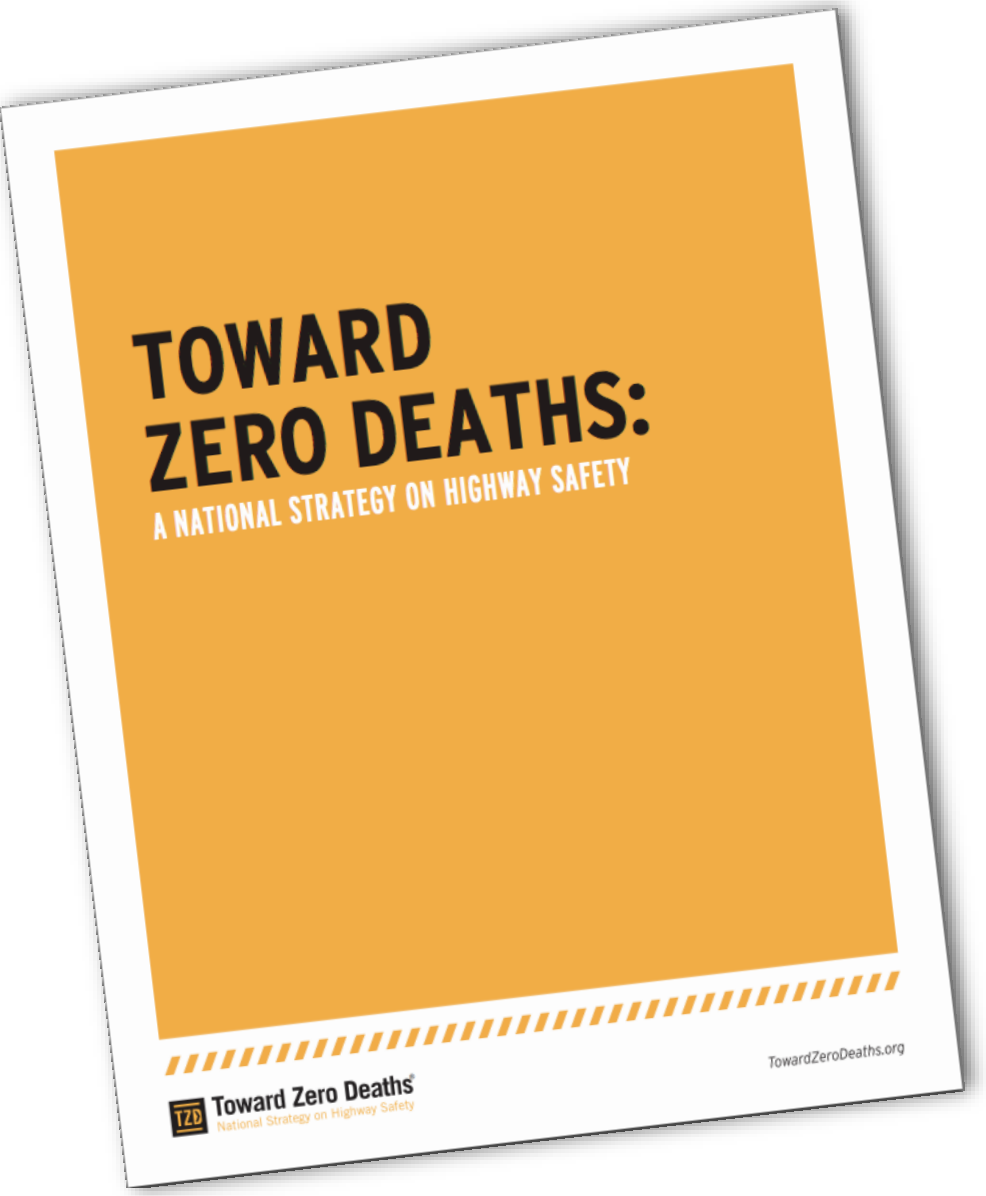
- 911 people died
- 50,042 people injured
- 219,112 traffic crashes were reported
- 7,056 work zone crashes

On an average day in Indiana,

- 2-3 people die
- 137 people are injured
- 600 crashes occur
- 19 work zone crashes

source: 2017 IN Crash Facts, ICJI

How many people are killed
on America's roads?



VISION:

A HIGHWAY SYSTEM FREE OF FATALITIES, CHANGING THE NATION'S CULTURE TO THE POINT WHERE EVEN ONE TRAFFIC-RELATED DEATH IS UNACCEPTABLE


294945
Jim
Brown

Fatal crash locations are random

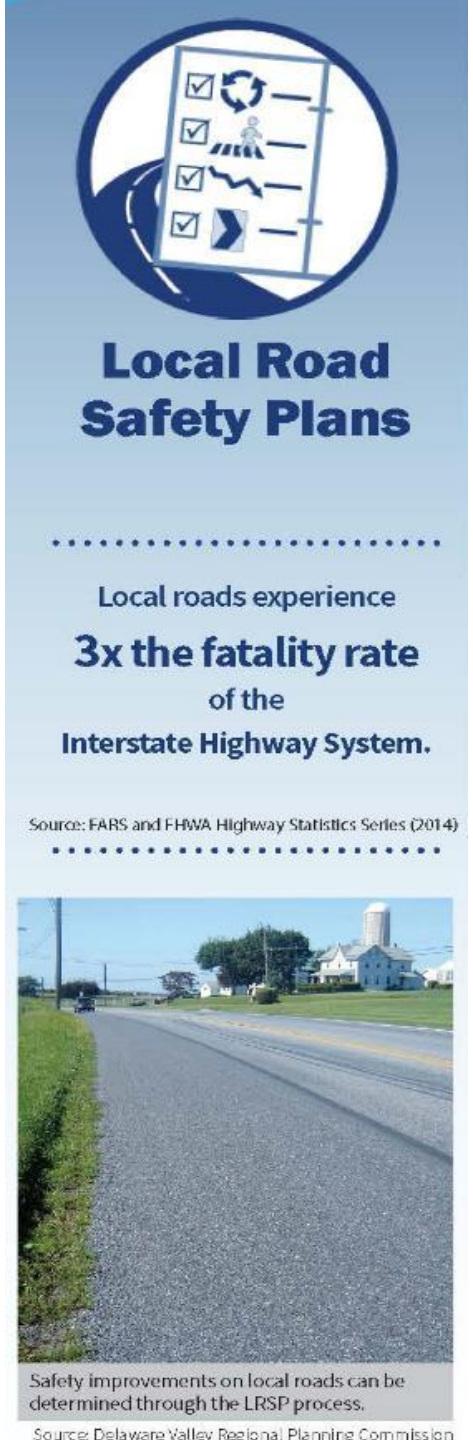

Rx
How Healthy is Your Road System?
Find out with systemic analysis
Systemic analysis is like a health screening for your road system. Just as your doctor identifies risk factors for illness, systemic analysis identifies locations that are at highest risk for severe crashes. Practitioners can then prioritize projects based on risk and apply low-cost safety treatments to reduce severe crashes across the whole at-risk system.
CURVE COUNTY - X RAY RESULTS
A
B
C
D
E
Symptoms
Severe roadway departure crashes on curves.
Possible Risk Factors:
Avg. Daily Traffic > 1,000 vehicles
Curve Radius < 1,000 feet
Intersection within Curve
Visual Trap within Curve
Severe Crash within Curve
Diagnosis
11% of all curves have 3 or more risk factors.
Lab Results:
Curve A
Curve B
Curve C
Curve D
Curve E
Treatment
Prioritize highest risk sites and treat with low-cost countermeasures such as chevron signs or rumble strips.
Follow-Up
Track and evaluate safety improvements. Further remediation can be implemented as needed.
Systemic vs. Systemwide
Systemic does not mean treating all locations. It allows agencies to treat the highest-risk sites within limited budgets.

Why Local Road Safety Plans?

MORE THAN **75%** OF ALL ROADS ARE MAINTAINED BY LOCAL AGENCIES

APPROXIMATELY **40-60%** OF FATALITIES OCCUR ON LOCALLY OWNED ROADWAYS

MINNESOTA SAW A **25%** REDUCTION IN COUNTY ROAD FATALITIES AFTER LRSP IMPLEMENTATION

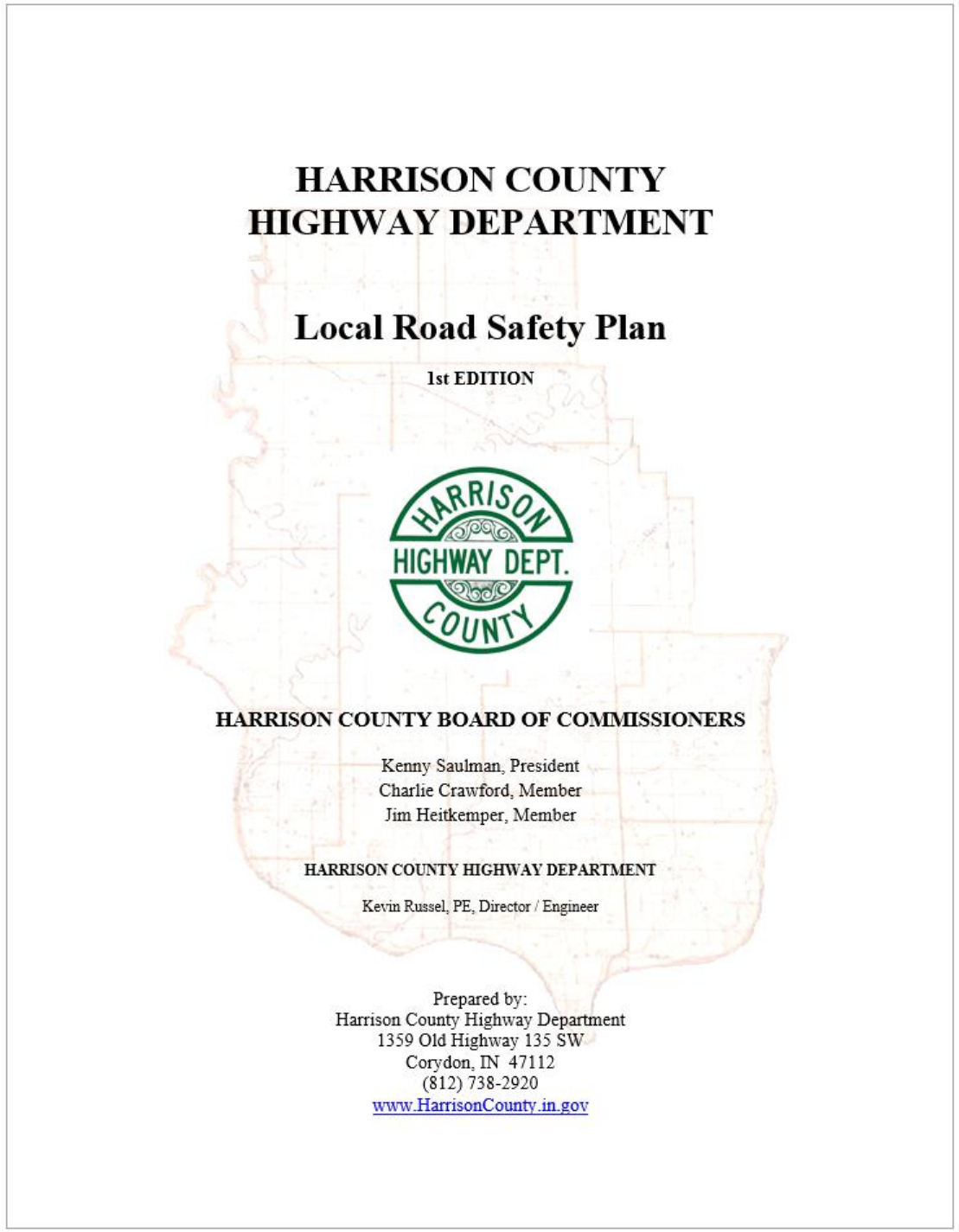


WHY LOCAL ROAD SAFETY PLANS?

- Reduction in severe crashes
- Greater awareness of road safety and risks
- Empower local agencies to incorporate safety into routine business (maintenance, capital improvements)
- Develop lasting partnerships
- Leverage funding opportunities
- Prioritize investments

WHAT IS A LOCAL ROAD SAFETY PLAN?

- Living document tailored to the local jurisdiction
- Collaboration among local, state, and/or federal agencies
- Stakeholder engagement representing 4 E's
- Identification of target crash types and crash risk with corresponding proven safety countermeasures
- Timeline and goals for implementation and evaluation



LRSPs under development:

- Boone County
- Lake County
- Monroe County
- Montgomery County
- Steuben County
- NIRCC

INDOT's Safety Plan:

STRATEGIC HIGHWAY SAFETY PLAN

2016 Revision

As required by 23 U.S.C. § 148 (c)(1), the Indiana Strategic Highway Safety Plan (SHSP) identifies significant highway safety problems and opportunities for saving lives, reducing suffering, and limiting economic losses resulting from traffic crashes. It guides the types of roadway infrastructure countermeasures that are preferred for use of federal Highway Safety Improvement Program funding to reduce the risks associated with the physical environment. It is coordinated with the traffic safety activities of state agencies, municipal entities, and other highway safety interests.

STEPS IN LRSP DEVELOPMENT

- **Step 1: Establish Leadership**
- Step 2: Analyze the Safety Data
- Step 3: Determine Emphasis Areas
- Step 4: Identify Strategies
- Step 5: Prioritize and Incorporate Strategies
- Step 6: Evaluate and Update the LRSP

LRSP PLAN DEVELOPMENT

1. ESTABLISH LEADERSHIP

- Need a Champion
- Establish a small working group
- Establish a larger stakeholder group
- Collaborate to leverage expertise and resources
- Determine Vision, Mission, and Goals

LRSP PLAN DEVELOPMENT

1. ESTABLISH LEADERSHIP

Harrison County Stakeholders:

- Commissioners
- Highway Department
- Sherriff's Department
- Health Department
- Planning & Zoning
- Hospital EMS
- Emergency Management
- Fire Chief's Association
- Economic Development Corp.
- Chamber of Commerce
- Convention & Visitors Bureau
- Purdue Ext. Office
- 3 School Corporations
- Blue River Services
- FHWA
- INDOT
- IN State Police
- INLTAP

VISION, MISSION, AND GOAL

INDOT SHSP

Vision – Reduce the risk of death or serious injury resulting from traffic crashes.

Mission – Reduce travel risk for all users of Indiana's streets, roads, and highways.

Goal – Move toward zero deaths resulting from traffic crashes.

VISION, MISSION, AND GOAL

HARRISON COUNTY

Vision – To ensure each user reaches their destination safely, Harrison County adopts the Toward Zero Deaths strategy for roadway safety.

Mission – Use a data-driven interdisciplinary approach to reduce the risk of injury or death to all users

Goal – Move Toward Zero Deaths

Measured by a reduction in fatalities, injuries, and property damage

Lead an interdisciplinary team of stakeholders to ensure that our TZD vision is propagated through each of the four E's

STEPS IN LRSP DEVELOPMENT

- Step 1: Establish Leadership
- **Step 2: Analyze the Safety Data**
  - Data-driven
  - Systemic, Risk-based

TERMINOLOGY

Site-specific "hot spot" approach (aka high-crash location):

➡ *Deploy site-specific improvements at locations with the highest frequency of crashes*

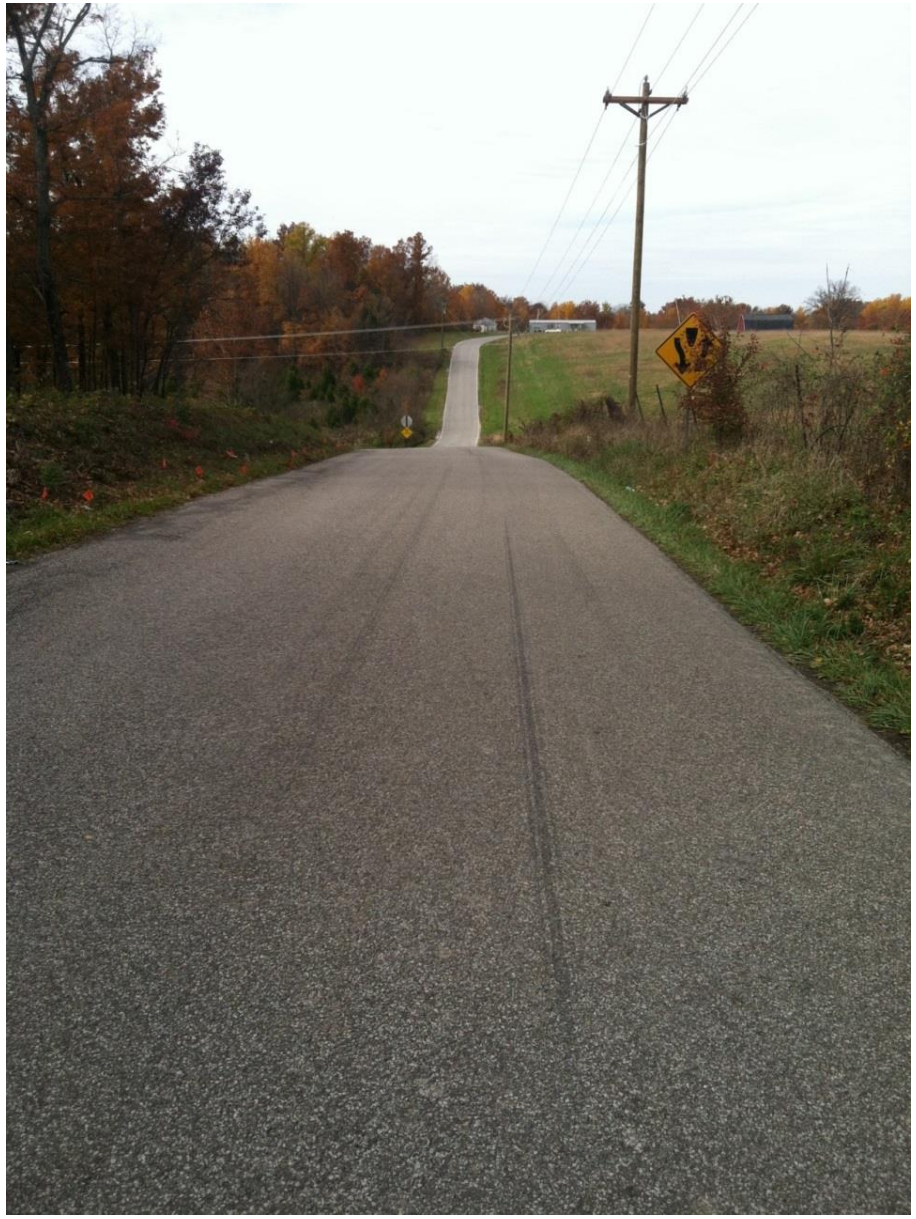
Systematic approach (aka systemwide):

➡ *Deploy countermeasures at all locations*

Systemic approach:

➡ *Deploy (low-cost) countermeasures at locations with the greatest risk*

No Crashes ≠ No Risk



No Crashes ≠ No Risk

Fatal Crash Types – IN Local Rural Roads

	Year 1	Year 2	Year 3
Roadway Departure	213	189	210
Angle/Left-Turn	80	65	60
Pedestrian	25	19	23
Rear-End	18	8	17
Animal	0	4	7
Backing	1	1	1

LRSP STEP 2: ANALYZE DATA

Crash data

- ARIES
- Law enforcement records
- Hospital/EMS records
- ICJI
- FARS

Traffic data

- Roadway Users
- Traffic Volumes
- Traffic Speeds

LRSP STEP 2: ANALYZE DATA

Roadway data

Asset Management Data

- Guardrail
- Culvert
- Bridges
- Signs

Roadway Characteristic Data

- Lane and Shoulder Width
- Roadside Hazards
- Driveway Density
- Presence of hills, curves
- Roadway Classification

LRSP STEP 2: ANALYZE DATA

Roadway data

Maintenance Logs

- Guardrail hit
- Signs knocked down
- Vegetation Removal
- Shoulder edge drop off

Data Collection

- Use aerial imagery
- Collect during slow times
- Summer interns

**“Do what you can,
with what you’ve got,
where you are.”**

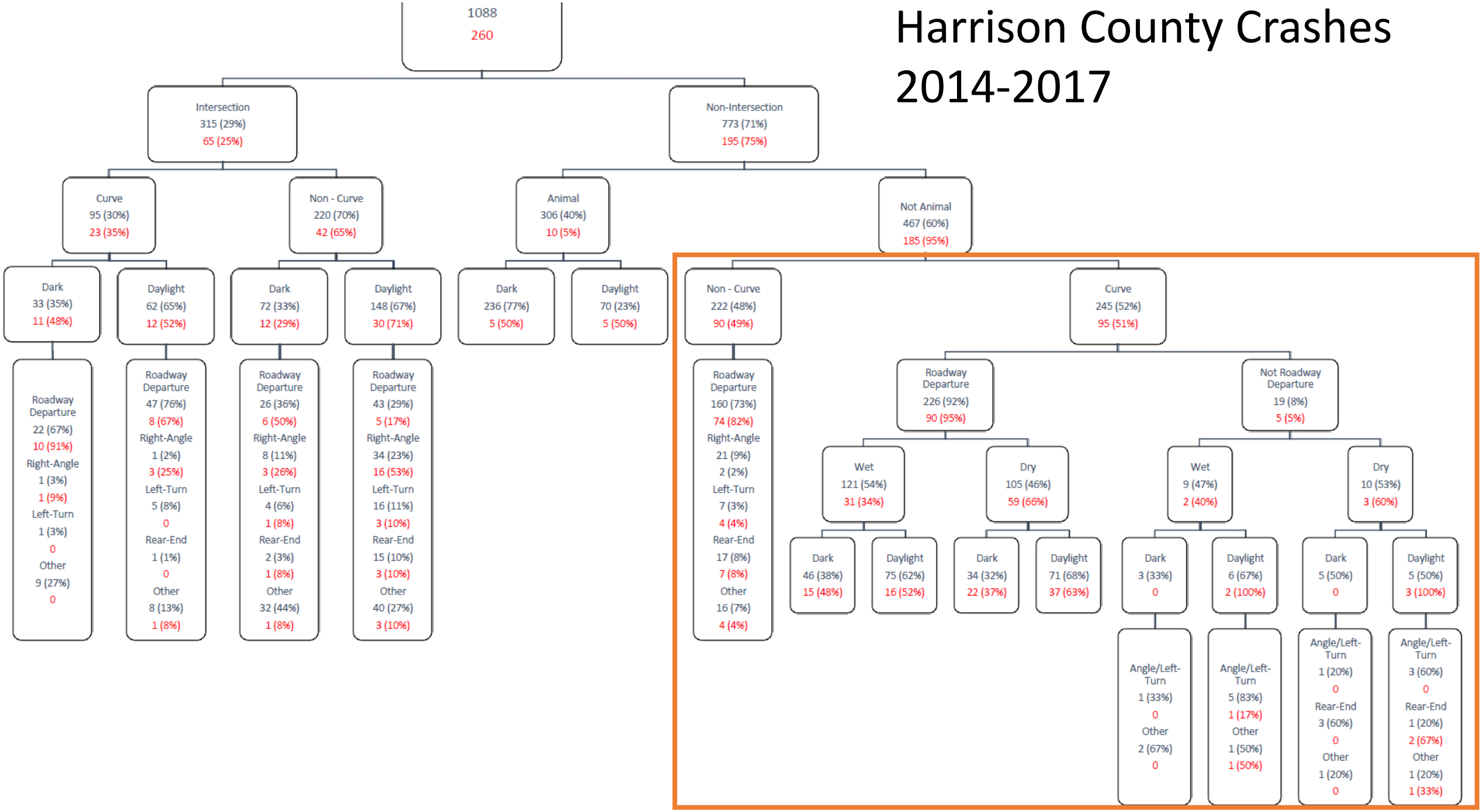
from Theodore Roosevelt: An Autobiography (1913)

LRSP STEP 2: ANALYZE DATA

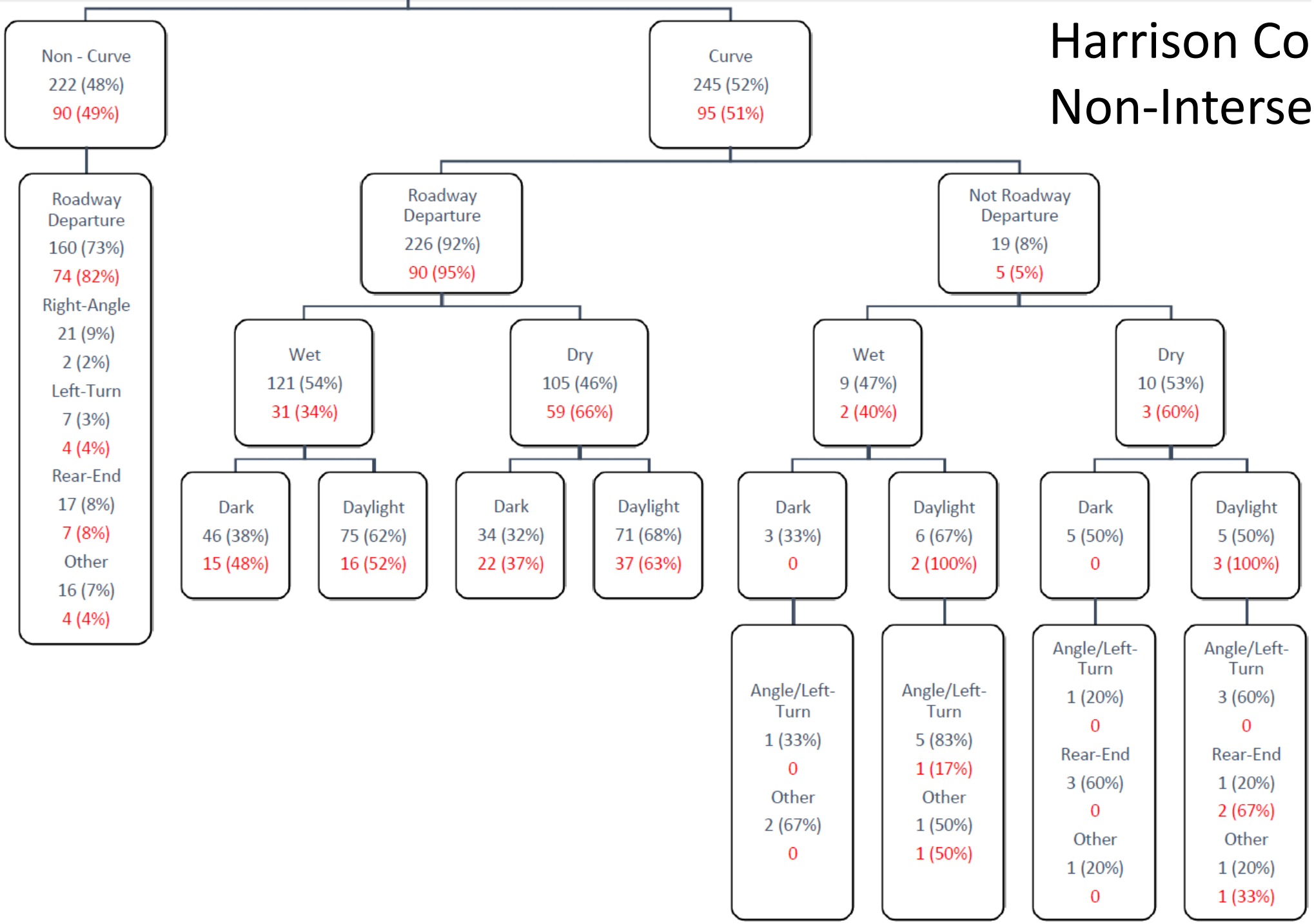
Systemic Approach Elements

- Identify crash pattern
- Identify common high-risk characteristics
- Select countermeasures
- Create prioritized list
- Implement across several locations

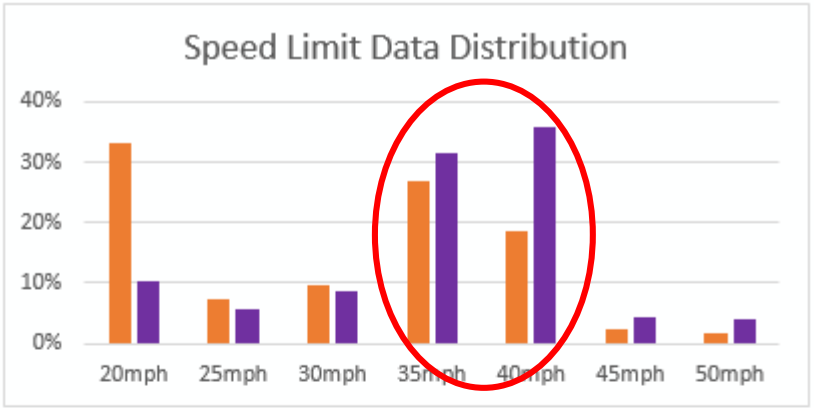
Harrison County Crashes 2014-2017



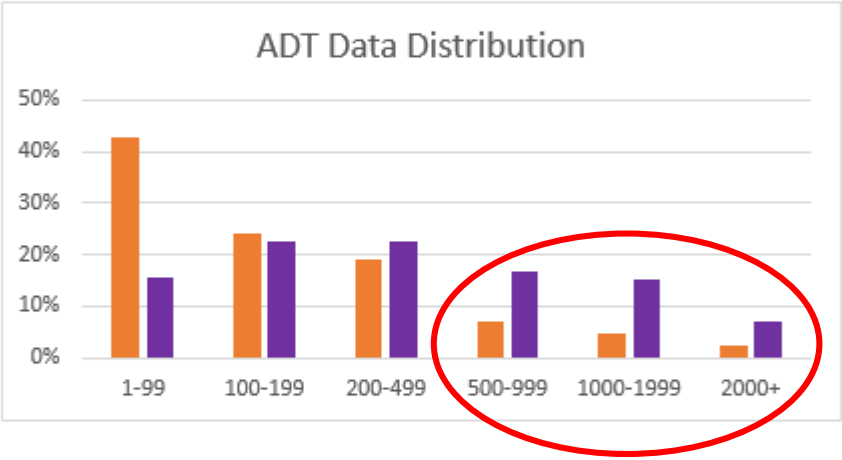
Harrison County
Non-Intersection crashes



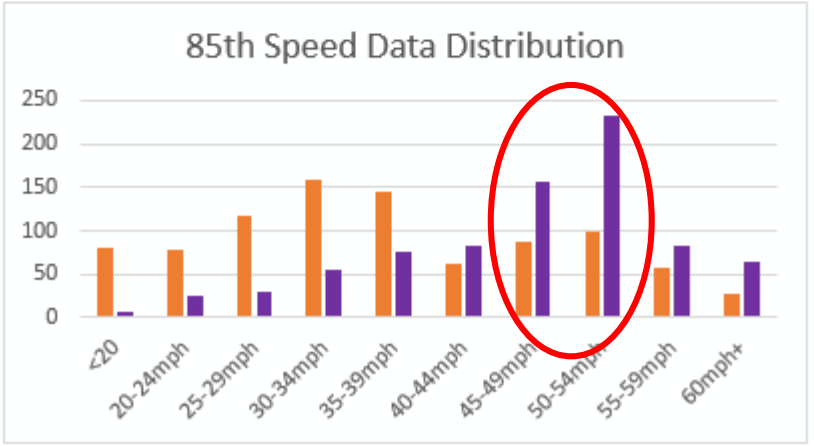
Speed Limit	Segment data		Crash data	
Total segments w/SL listed	544		669	
15mph	1	0%	0	0%
20mph	181	33%	68	10%
25mph	39	7%	37	6%
30mph	53	10%	57	9%
35mph	146	27%	211	32%
40mph	102	19%	239	36%
45mph	13	2%	30	4%
50mph	9	2%	27	4%



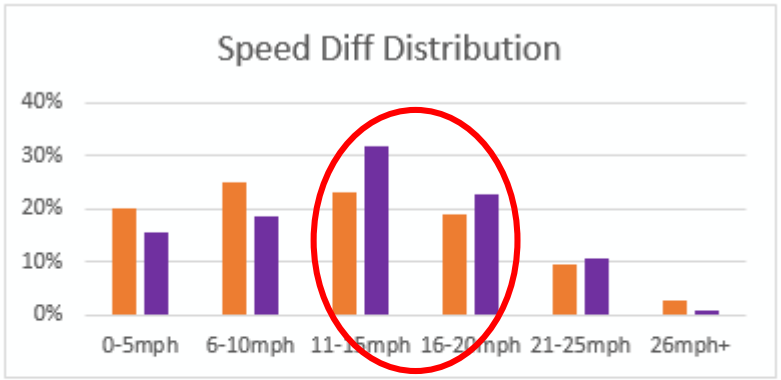
ADT	Segment data		Crash data	
Total segments w/ADT listed	1423		1292	
1-99	608	43%	202	16%
100-199	346	24%	294	23%
200-499	271	19%	292	23%
500-999	98	7%	218	17%
1000-1999	69	5%	195	15%
2000+	31	2%	91	7%



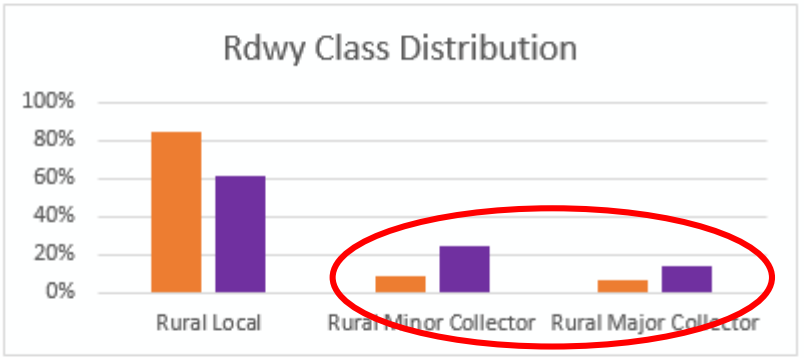
85th Speed	Segment data		Crash data	
Total segments w/info listed	914		811	
<20	81	9%	7	1%
20-24mph	77	8%	26	3%
25-29mph	117	13%	29	4%
30-34mph	158	17%	54	7%
35-39mph	146	16%	76	9%
40-44mph	63	7%	83	10%
45-49mph	88	10%	157	19%
50-54mph	100	11%	232	29%
55-59mph	57	6%	83	10%
60mph+	27	3%	64	8%



Speed Diff	Segment data		Crash data	
Total segments w/info listed	455		651	
0-5mph	91	20%	101	16%
6-10mph	113	25%	120	18%
11-15mph	106	23%	208	32%
16-20mph	87	19%	148	23%
21-25mph	43	9%	68	10%
26mph+	12	3%	6	1%

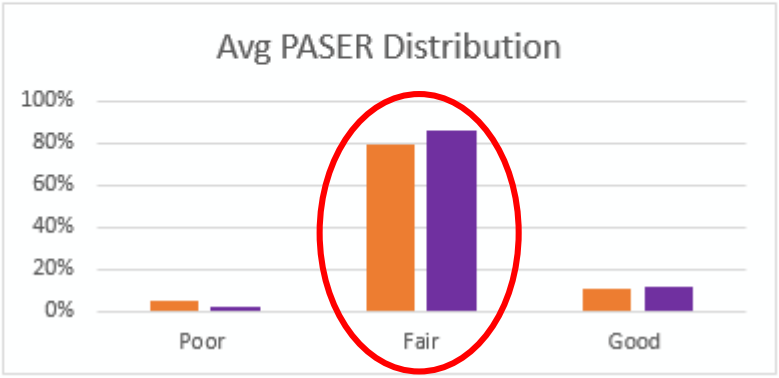


Roadway Classification	Segment data		Crash data	
Total segments w/class listed	1625		1332	
Rural Local	1380	85%	824	62%
Rural Minor Collector	141	9%	329	25%
Rural Major Collector	103	6%	179	13%



PASER Rating	Segment data		Crash data	
Total segments w/paser listed	1550		1344	
Poor	82	5%	26	2%
Fair	1298	80%	1161	86%
Good	170	10%	157	12%

Poor (1-4.9)
Fair (5-7.9)
Good (8-10)

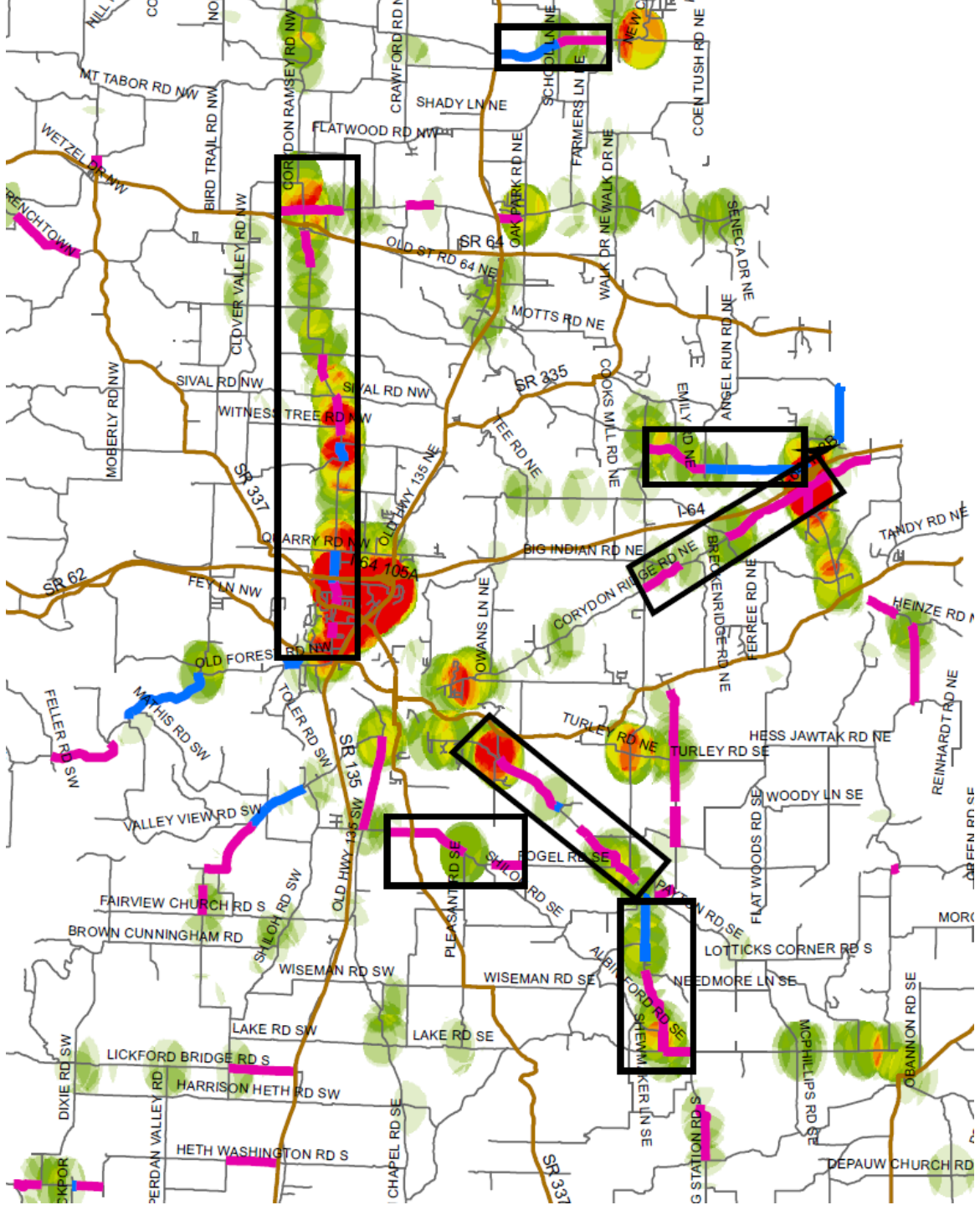


LRSP STEP 2: ANALYZE DATA

“High-Priority” Harrison County Road

1. Speed Limit: **35-40mph**
2. Volume: **500+ vehicles/day**
3. 85th Speed: **45-54mph**
4. Speed Differential: **11-20 mph**
5. Roadway Classification: **Collector (major & minor)**
6. PASER rating: **Fair**

Heat Map of High-Priority Corridors



Legend

- State Roads
- High Risk 5
- High Risk 6
- High Risk Corridors

	High-Priority Roads	*Entire System*	
Total miles:	26.1	825	3%
Total crashes:	238	1332	18%
Total Fatal & Injury crashes:	41	257	16%

STEPS IN LRSP DEVELOPMENT

- Step 1: Establish Leadership
- Step 2: Analyze the Safety Data
- **Step 3: Determine Emphasis Areas**
  - What does data say?
  - What does community say?
  - What does law enforcement say?
  - What do hospitals say?
  - What do schools say?

LRSP STEP 3: DETERMINE EMPHASIS AREAS

From INDOT SHSP:

- Data
- Roadway Departure
- Intersection
- Motorcycle
- Bicycle
- Pedestrian
- Rail Crossing
- Large Trucks
- High-Speed Multi-Lane Rear-End
- Work Zone
- Human Behavior
- Older Drivers & Pedestrians

LRSP STEP 3: DETERMINE EMPHASIS AREAS

From Montgomery County Draft LRSP:

- Safety Culture
- Roadway Departure Crashes
- Animal Crashes
- Distracted Driving Crashes
- School Zone Crashes
- Data Collection & Analysis

STEPS IN LRSP DEVELOPMENT

- Step 1: Establish Leadership
- Step 2: Analyze the Safety Data
- Step 3: Determine Emphasis Areas
- **Step 4: Identify Strategies**
  - Countermeasure Selection

FHWA's Proven Safety Countermeasures

Roadside Design Improvement at Curves

Reduced Left-Turn Conflict Intersections

Systemic Application of Multiple Low Cost Countermeasures at Stop-Controlled Intersections

Leading Pedestrian Interval

Local Road Safety Plan

USLIMITS2

Enhanced Delineation and Friction for Horizontal Curves

Longitudinal Rumble Strips and Stripes on Two-Lane Roads

Median Barrier

Safety Edge$_{SM}$

Backplates with Retroreflective Borders

Corridor Access Management

Dedicated Left- and Right-Turn Lanes at Intersections

Roundabouts

Yellow Change Intervals

Medians and Pedestrian Crossing Islands in Urban and Suburban Areas

Pedestrian Hybrid Beacon

Road Diet

Walkways

Road Safety Audit

HSIP-ELIGIBLE SYSTEMIC PROJECTS

Roadway Departure

- Add High Friction Surface Treatment (HFST)
- Install/upgrade curve warning signs
- Install new pavement markings (center and/or edge)
- Install new rumble stripes (center and/or edge)
- Install new guardrail or median barrier
- Upgrade guardrail end treatments
- Remove roadside hazards

HSIP-ELIGIBLE SYSTEMIC PROJECTS

Roadway Departure

➡ Add High Friction Surface Treatment

- 50% reduction in wet road crashes (NYSDOT)
- 20% reduction in all crashes (NYSDOT)

➡ Install chevrons and curve warning signs

- 51% reduction of wet road crashes (CMF Clearinghouse)
- 34% reduction in nighttime crashes (CMF Clearinghouse)
- 41% reduction in all crashes (CMF Clearinghouse)
- Benefit/Cost ratio of 8:1 (CT and WA)

HSIP-ELIGIBLE SYSTEMIC PROJECTS

Sign Projects

- Install/upgrade curve warning signs
- Upgrade regulatory and warning signs
- Conduct sign inventory

LRSP STEP 4: IDENTIFY STRATEGIES

Montgomery County LRSP:

- Develop and promote a safety culture
- Maintain striping on most paved roads
- Provide Safety Edge on new or resurfaced roads
- Education campaign about deer crashes
- Establish a distracted driving task force

LRSP STEP 4: IDENTIFY STRATEGIES

Montgomery County LRSP:

- Educate local law enforcement about importance of accurate crash reporting
- Develop a drainage and berm cutting maintenance program
- Maintain striping in wooded areas
- Reevaluate snow routes based on prevalence of snow/ice crashes
- Regular traffic counts and data collection

STEPS IN LRSP DEVELOPMENT

- Step 1: Establish Leadership
- Step 2: Analyze the Safety Data
- Step 3: Determine Emphasis Areas
- Step 4: Identify Strategies
- **Step 5: Prioritize and Incorporate Strategies**
- **Step 6: Evaluate and Update the LRSP**

LRSP – HOW TO GET STARTED

- Safety Culture
- Stakeholders - Vision, Mission, Goal
- Data

PURDUE UNIVERSITY

CENTER FOR ROAD SAFETY

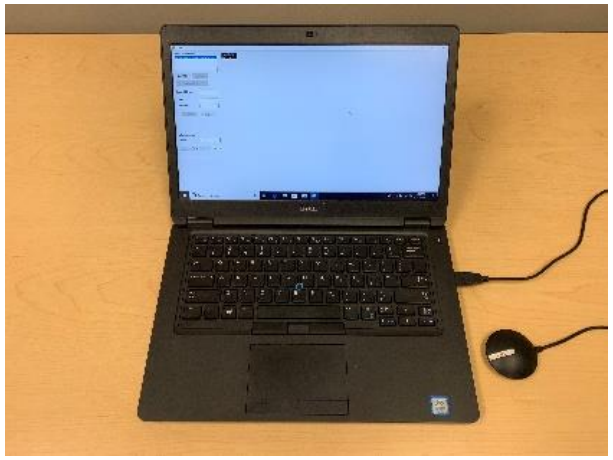
A PRACTICAL AND SOUND APPROACH TO SAFETY PROBLEM IDENTIFICATION AND MITIGATION ON COUNTY ROADS

LTAP LOCAL TECHNICAL ASSISTANCE PROGRAM

DATA COLLECTION

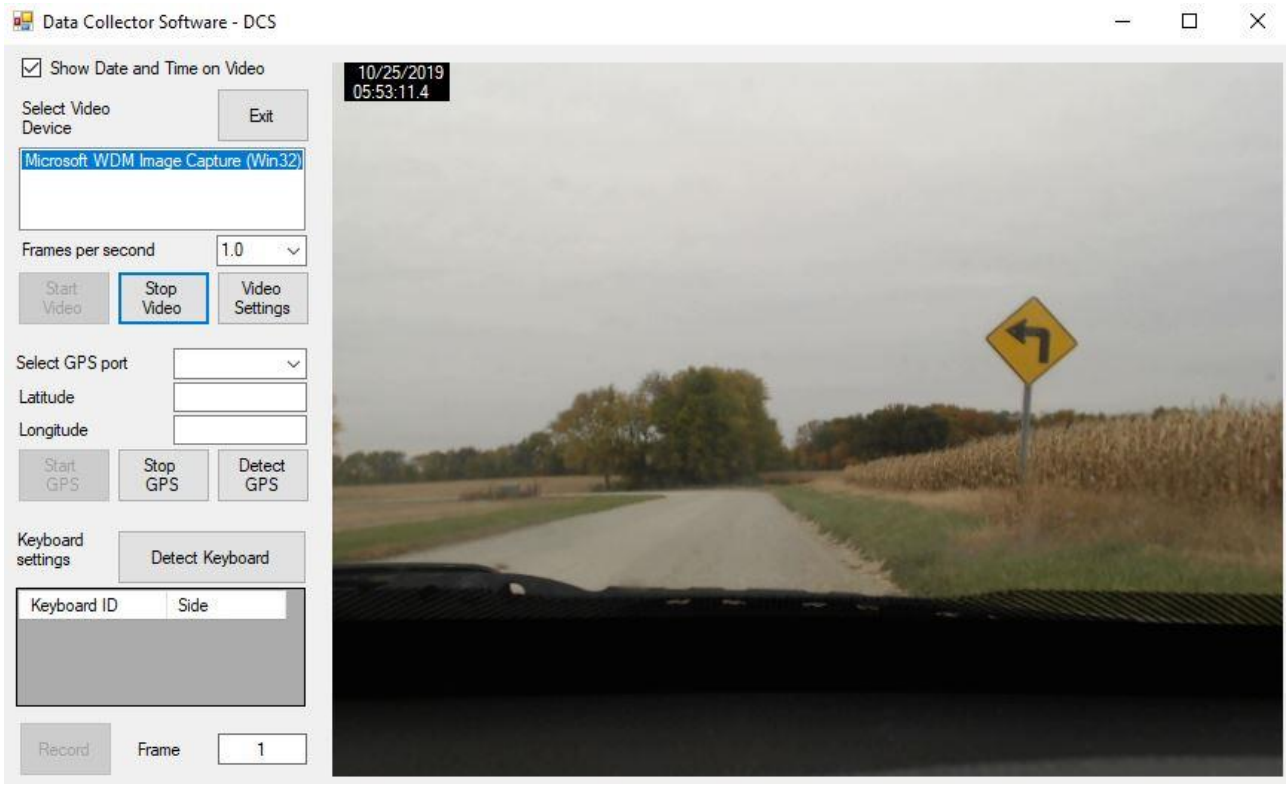
Components

- Data collection vehicle
- Laptop
- Portable GPS
- Portable camera
- Additional keyboard *(optional)*



DATA COLLECTOR SOFTWARE

- Build or supplement existing database
- Accommodates one or more observers (keyboards) for collecting data
- Keyboard codes denote different road features
- Collects video images and coordinates of road features



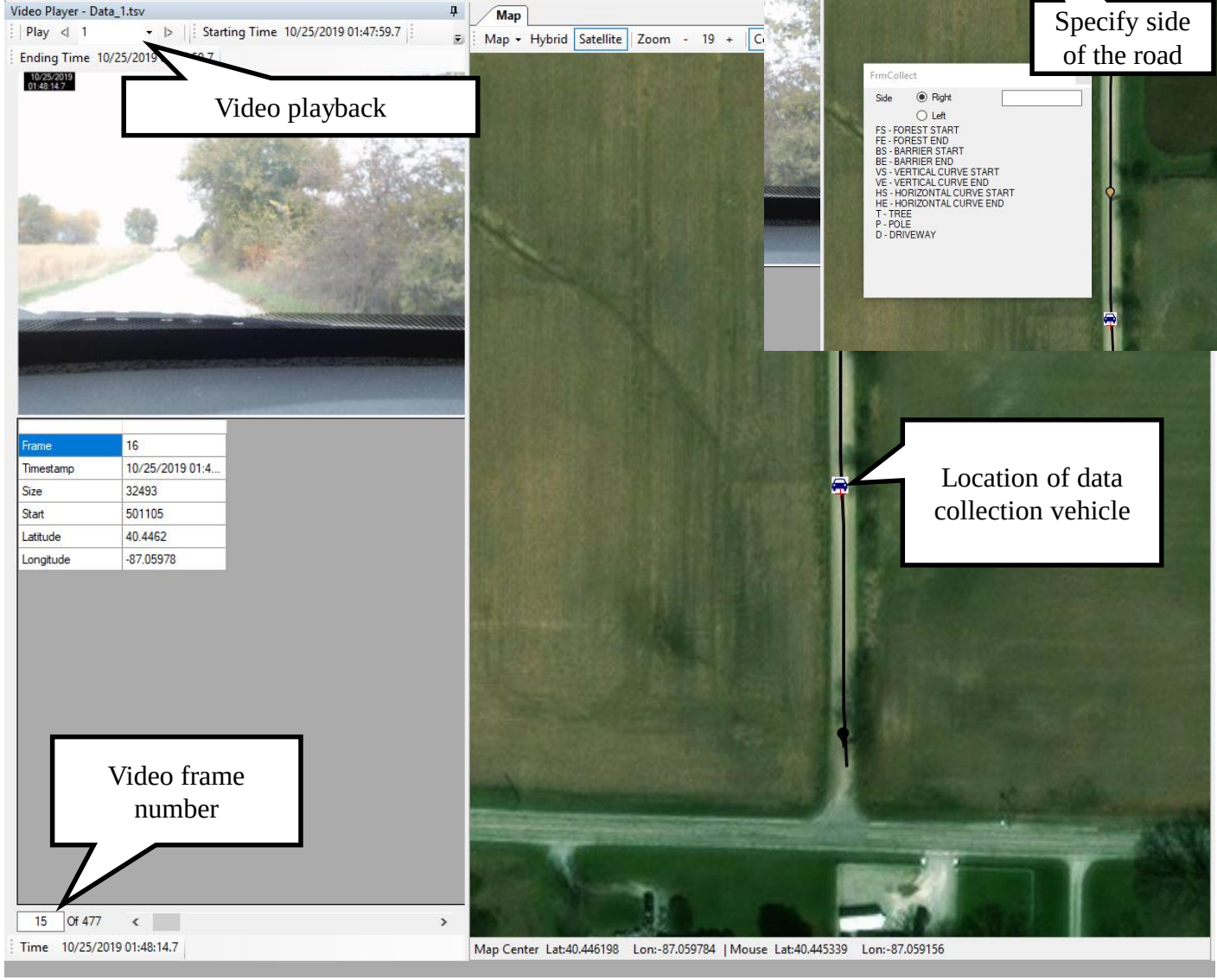
KEYBOARD CODES

EXAMPLES

Code	Description
FS	Forest start
FE	Forest end
BS	Barrier start
BE	Barrier end
HS	Horizontal curve start
HE	Horizontal curve end
T	Tree
P	Pole
D	Driveway

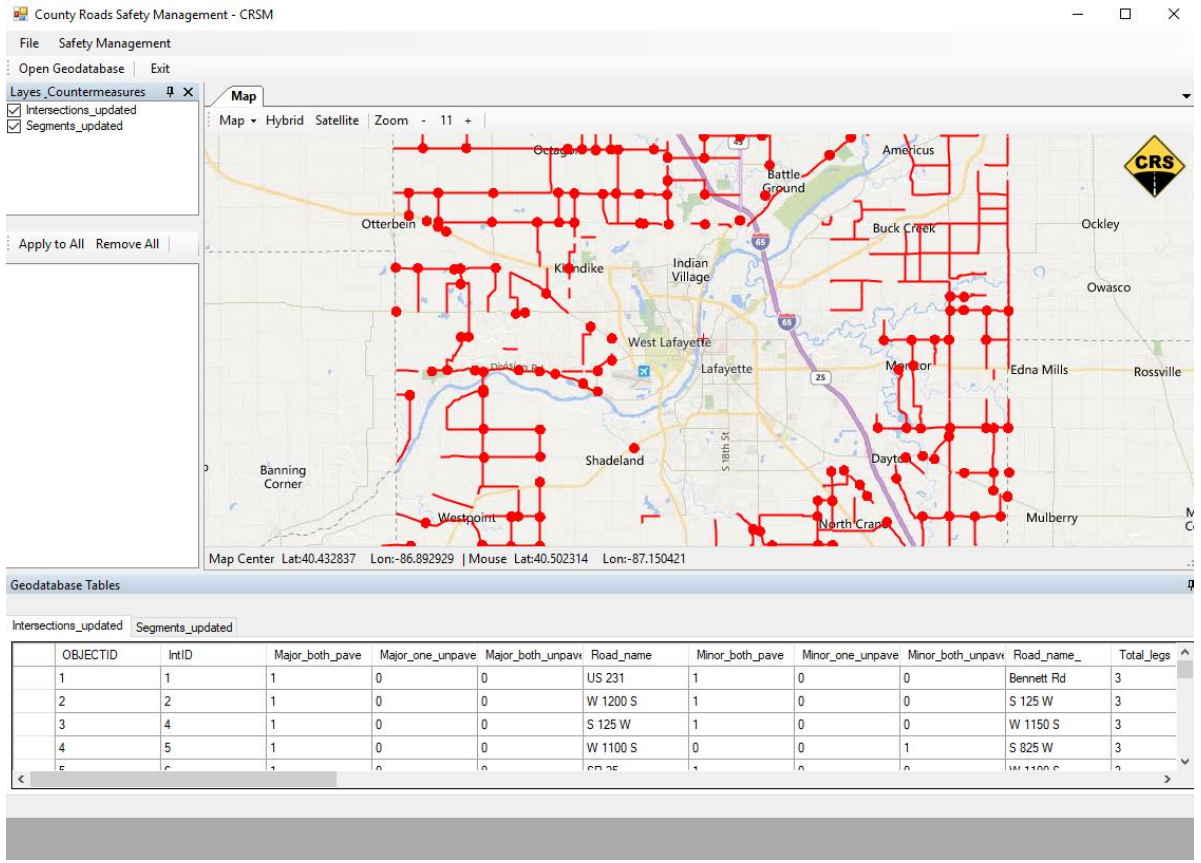
POST PROCESSING

- Map and video player
- Data inspection, revision, and extraction of additional road features
- Can conduct an entire data collection using only GPS and video data
- Converts data into format for safety management



COUNTY ROAD SAFETY MANAGEMENT SOFTWARE

- Identify and mitigate safety issues
- Catalog of countermeasures and user-specified selection criteria
- User selects countermeasures and implementation locations
- Calculates benefits and costs for each countermeasure, road element, and across the network as a whole



INDIANA CRASH STATISTICS

➡ ***On an average day in Indiana,***

2-3 people die

137 people are injured

Government's first duty and highest obligation is public safety.

- Arnold Schwarzenegger

Laura Slusher, PE

INTLAP / HELPERS at

Purdue University

lslusher@purdue.edu

765 494 7038