

# Developing an Evaluation Framework

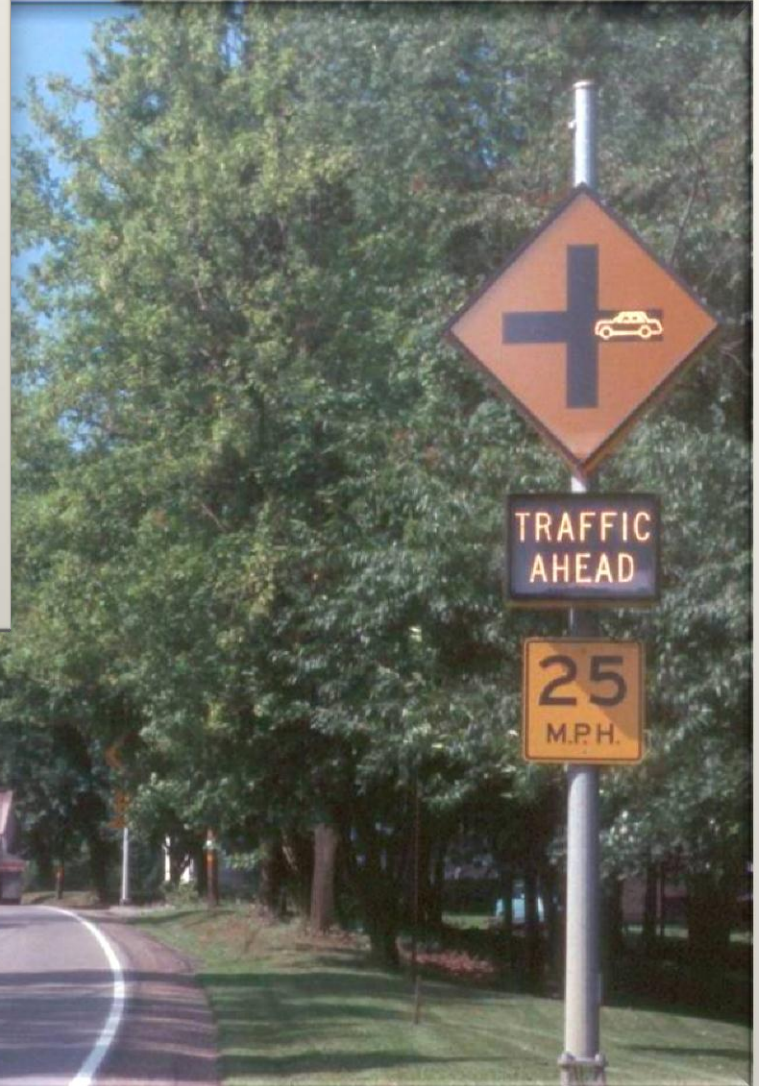
*Intersection Warning Systems Workshop*

September 15<sup>th</sup>, 2011

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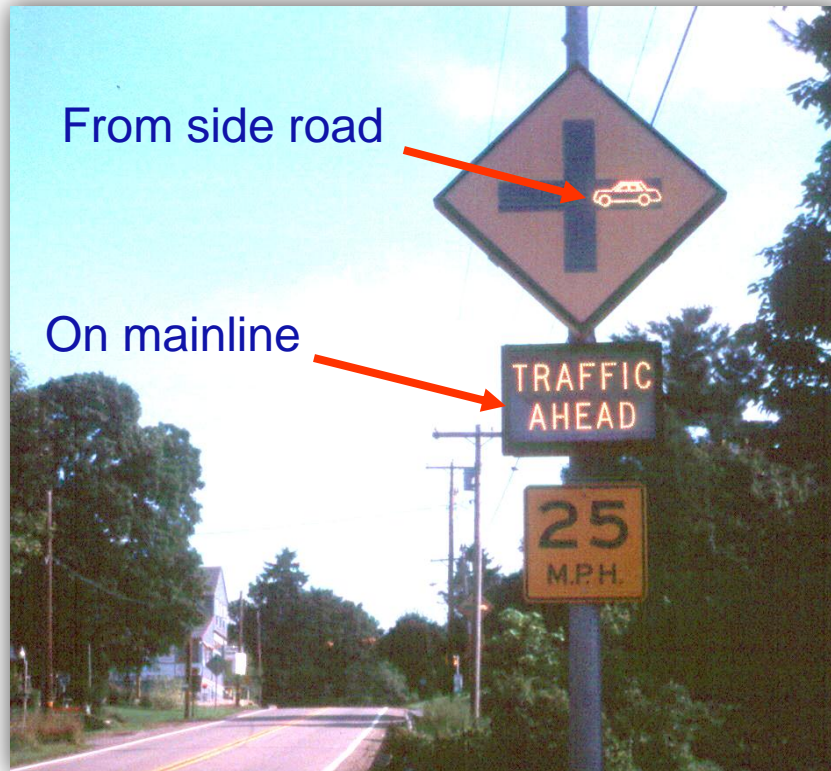
Manager  
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# PennDOT's Collision Avoidance System (CAS)



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Mainline sign activates when traffic is entering from either side road direction or stopped at intersection



# PennDOT's Collision Avoidance System (CAS)

Side Road sign activates when mainline traffic is approaching from either direction



# Why CAS?

Both intersections are on vertical curves that restrict sight distance



# Why CAS?

- Vehicles on mainline were speeding
- Vehicles from side streets have to creep into mainline to see vehicles on mainline

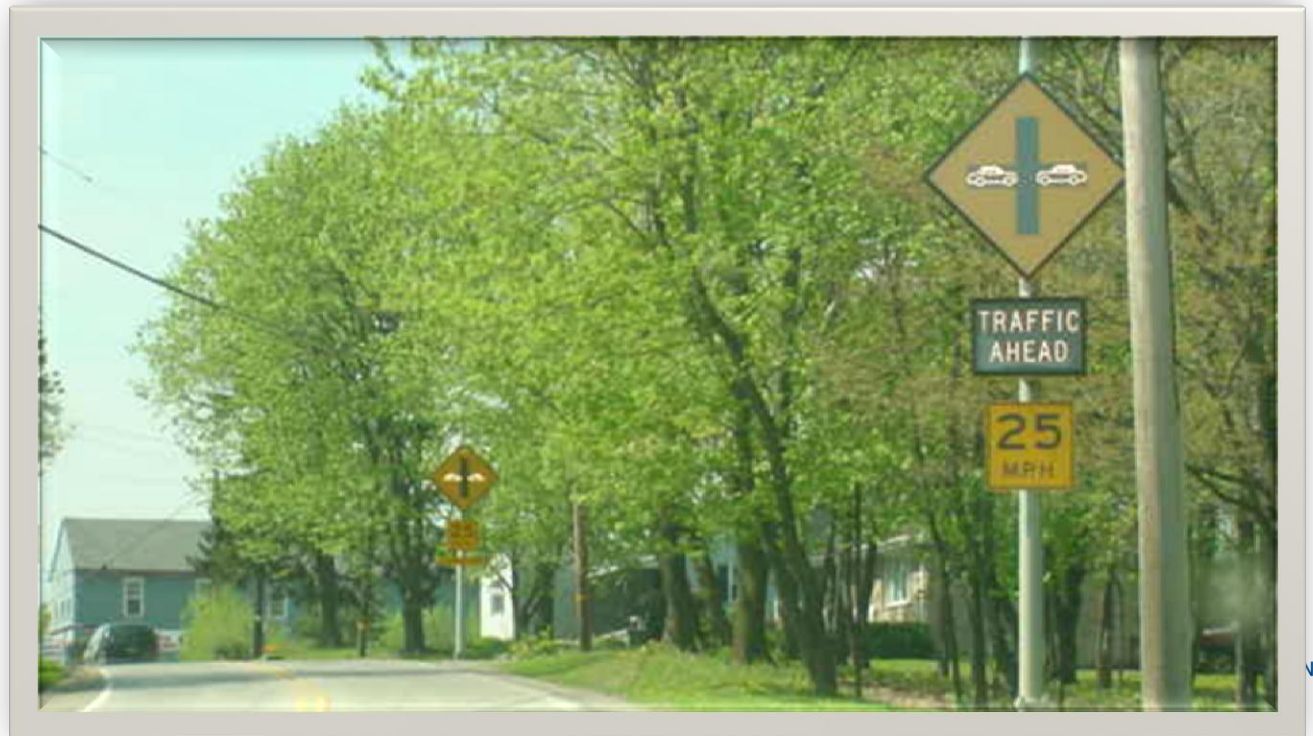


# Why CAS?

- Other efforts to improve the safety of the intersection such as convex mirrors, paint markings, conventional signing and State Police assistance were ineffective.
- Reconstruction would be very costly and require additional right-of-way
- CAS has a small impact on the community and a much lower cost (\$422k for both)

# CAS Info

- Both locations were completed in November 2003
- Maintenance of the CAS is approx. \$24,000 per year (cleaning of system every three months)





# Reliability

## Risk management concerns

- Malfunctions?
- Placing faith in an electrical device?

## Maintained by PennDOT

- Fail safe – All signs flash continuously
- Uses a lead-acid battery back-up
- County stockpile nearby to monitor
- Electrical contractor on call 24X7 @ \$2,000/mo.
  - Covers minor repairs needed by electrical contractor (twice)
  - Includes cleaning every 3 months



# Data Collected/Analyzed

- **2 Locations**
- **Collected 7 yrs. before/after crash data**
  - **Min. of 3-5 yrs. Recommended**
- **All severity crashes should be analyzed (*Due to low volume of roads it was applied to*):**
  - **Fatalities**
  - **Major Injuries**
  - **Moderate Injuries**
  - **Minor Injuries**
  - **Property Damage Only**
  - **Unknown Injuries**
- **Measured reduction in crashes and severity of crashes**

# Cost Benefit Analysis

PennDOT estimates the economic loss due to reportable traffic crashes (2009 Pennsylvania Crash Facts and Statistics).

Following are the average cost to society for different categories (in 2008 dollars).

- Death's.....\$5,816,848
- Major Injuries.....\$1,303,332
- Moderate Injuries.....\$87,107
- Minor Injuries.....\$6,905
- Property Damage Only.....\$2,762
- Unknown Injuries.....\$6,905

*The economic loss per Pennsylvania citizen is based on the ratio of estimated total cost to the estimated total population of Pennsylvania.*

# Cost Benefit Analysis

## Example Cost Benefit Calculation

- Calculate the difference in all crash types

	Fatalities	Major	Moderate	Minor	PDO	Unknown Severity
SR 38 & Hooker Rd (Before 1997-2003)	1	0	4	2	4	0
SR 38 & Hooker Rd(After 2004-2010)	0	0	1	4	1	0
<b>Difference</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>-2</b>	<b>3</b>	<b>0</b>

- Multiply each times the average cost to society for that crash type

Difference	1	0	3	-2	3	0
Avg Cost to Society	\$5.8M	\$1.3M	\$87k	\$6,905	\$2,762	\$6,905
<b>Total</b>	<b>\$5.8M</b>	<b>\$0</b>	<b>\$261k</b>	<b>-\$14k</b>	<b>\$8k</b>	<b>\$0</b>

- The sum of these is the economic savings due to reduction in fatalities and injuries (\$6.07M)

# Cost Benefit Analysis

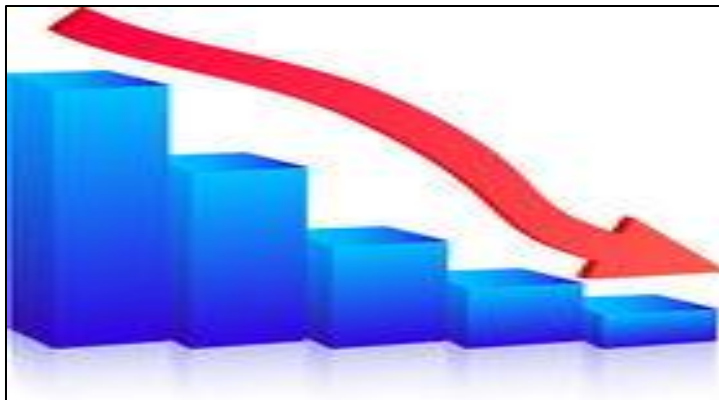
## Cost Benefit Tables

			Fatalities	Major	Moderate	Minor	PDO	Unknown Severity	Economic Savings Due to Reduction in Fatality/Injury
SR 38 & Hooker Rd (Before 1997-2003)			1	0	4	2	4	0	
SR 38 & Hooker Rd (After 2004-2010)			0	0	1	4	1	0	
Difference			1	0	3	-2	3	0	<b>\$6,072,645</b>
			Fatalities	Major	Moderate	Minor	PDO	Unknown Severity	Economic Savings Due to Reduction in Fatality/Injury
SR 38 & N. Washington Rd (Before 1997-2003)			0	2	10	9	0	0	
SR 38 & N. Washington Rd (After 2004-2010)			0	0	3	6	5	0	
Difference			0	2	7	3	-5	0	<b>\$3,223,318</b>
								<b>Total</b>	<b>\$9,295,963</b>

# Cost Benefit Analysis

As a result of the installation of the CAS:

- Total number of crashes at these two sites went down from 32 to 20
- Decrease in crash frequency as well as severity
- Mainline speeds may go up as a result of knowing about the lack of traffic on the secondary road, it seems to reduce speed at the time of presence of vehicles on the secondary road. This was concluded based on the speed study as well as a reduction in severity of crashes at these locations.
- It may also be viewed as increasing the efficiency of the roadway while at the same time improving safety



# Cost Benefit Analysis

## Cumulative Analysis (Both locations)

- **Cost of Projects - \$422,000**
- **7 year Economic Savings due to a reduction in Fatalities/Injuries of \$9,259,963**
- **Yearly Economic Savings of \$1,322,852**
- **7 Year Benefit/cost ratio of 22:1**
- **Yearly Benefit/Cost ratio of 3:1**

# What would we have done differently?

1. Since the installation of this system in 2003 there have been advancements in technology that can be implemented to future systems to reduce costs and improve reliability
  - Pole mounted radar to detect approaching vehicles
  - L.E.D.'s
  - Wireless communications systems
2. Public outreach (media) is needed to educate the public on understanding these signs
3. Future implementation would be eased by developing a standardized CAS to avoid driver confusion



QUESTIONS???