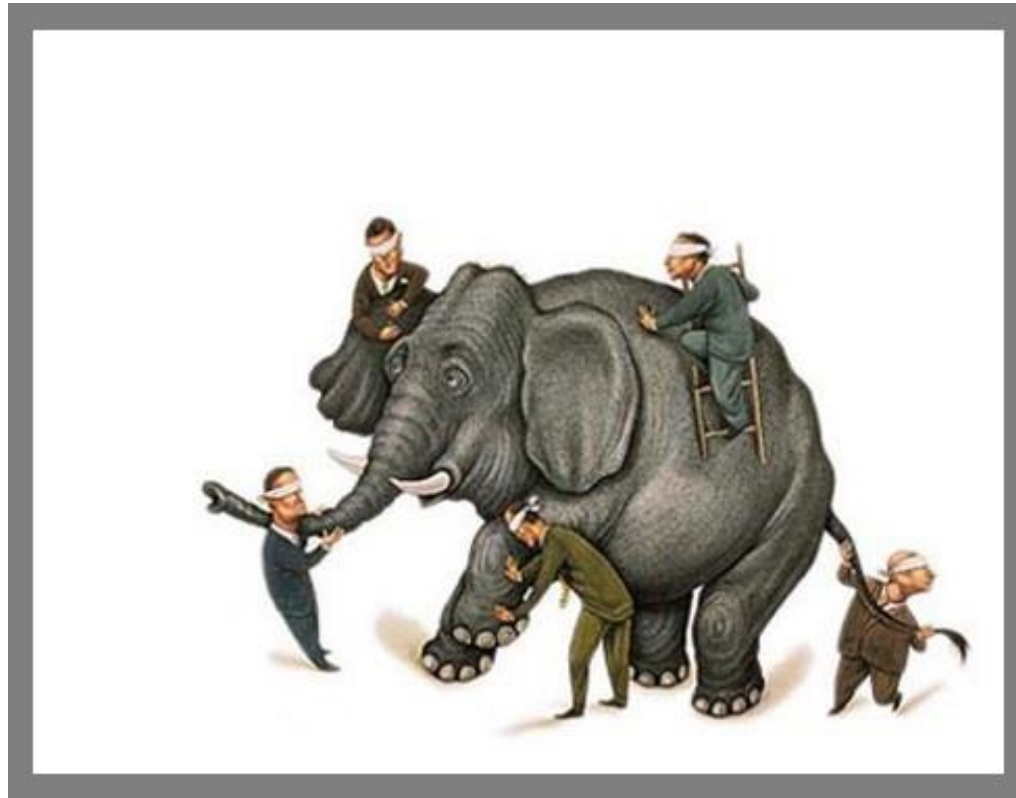
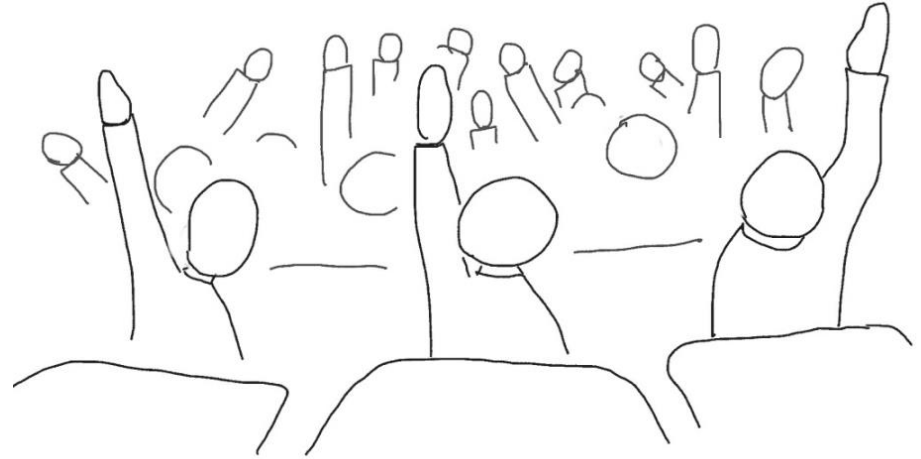


How Tippecanoe County is Improving a Local Intersection by Using an RSA and Federal Funds



Survey....

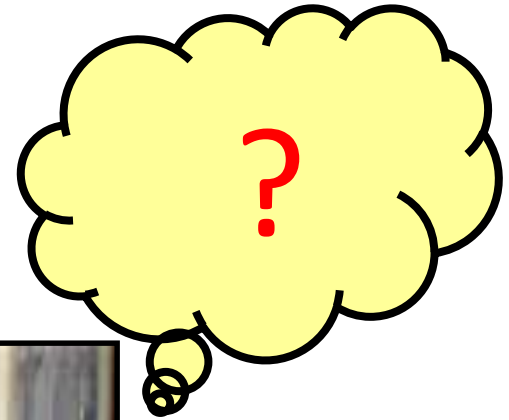


Who knows what an RSA is?

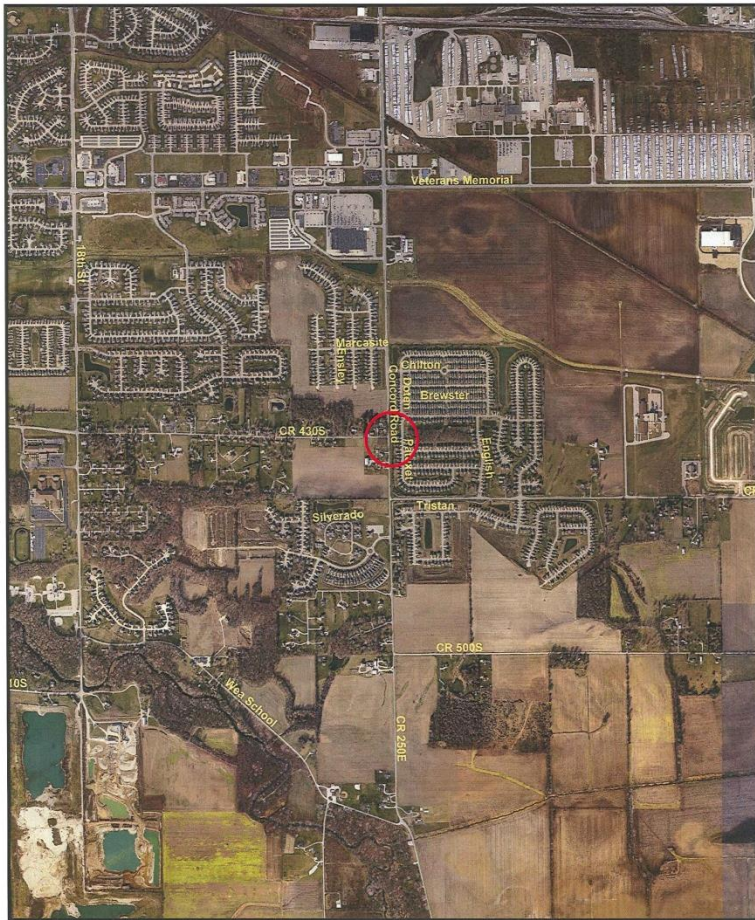
Who has performed an RSA?

What would you like to learn from this presentation?

Quick Review: So What is an RSA?



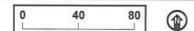
Step 1: Identify the Location: Concord Road & CR 430S



2012 Aerial Photography



2012 Aerial Photography



Why this Location?



Concord Road (CR 250E) Looking North at Intersection



Concord Road

Looking South from Intersection



Concord Road

Looking North from Intersection



Elevation Challenges



At Intersection Looking West



CR 430S Elevation Changes



Other Challenges



Step 2: Compile Reference Data

- Aerial Photos
- Road/Intersection Geometric Data
 - Crash Data
 - Traffic Volume
 - Topography
- Parcel Boundaries
 - Zoning

Road Geometry

CR 430S

- Functional Class = Local
- Road widths averages 21', two 10.5' lanes
- Earth/gravel shoulders, 1'–2' wide
- Pavement condition is “Good”, Overall Condition Index = 67 (100 Scale)
- Posted Speed Limit = 40 mph
- Vehicle Class
 - Motorcycles = 1%
 - Cars/light trucks = 92.1%
 - 2-3 axle, single frame trucks = 2.9%
 - Semi w/2 or more units = 1.9%
 - Unknown = 2.1%
- Signage = Stop and Street Name signs eastbound (southwest corner)

Road Geometry

Concord Rd (south leg)

- Functional Class = Minor Collector
- Road widths averages 21', two 10.5' lanes
- Earth/gravel shoulders, 1'–2' wide
- Pavement condition is “Good”, Overall Condition Index = 72 (100 Scale)
- Posted Speed Limit = 40 mph
- Vehicle Class
 - Motorcycles = .08%
 - Cars/light trucks = 88.7%
 - 2-3 axle, single frame trucks = 4.3%
 - Semi w/2 or more units = 3.2%
 - Unknown = 2.9%
- Signage = 40 MPH sign 700' south of CR430S

Road Geometry

Concord Rd (north leg)

- Functional Class = Major Collector
- Road widths averages 21', two 10.5' lanes
- Earth/gravel shoulders, 1'–2' wide
- Pavement condition is “Good”, Overall Condition Index = 79 (100 Scale)
- Posted Speed Limit = 40 mph
- Vehicle Class
 - Motorcycles = .08%
 - Cars/light trucks = 88.7%
 - 2-3 axle, single frame trucks = 4.3%
 - Semi w/2 or more units = 3.2%
 - Unknown = 2.9%
- Signage = 40 MPH sign 400' north of CR430S

Concord at CR 430S

Crash Report Information, January 2010 through February 2015

Crash Summary

#	Date	Time	# of Vehicles Involved	Number Injured	Number Dead	Manner of Collision	Primary Factor	Light Condition	Weather Condition	Surface Condition	Damage Estimate
1	5/3/2010	1735	1	1	0	RAN OFF ROAD	SPEED TOO FAST FOR WEATHER CONDITIONS	DAYLIGHT	RAIN	WET	\$1001 TO \$2500
2	5/11/2010	0916	2	1	0	REAR END	FOLLOWING TOO CLOSELY	DAYLIGHT	CLOUDY	WET	\$2501 TO \$5000
3	5/14/2010	0344	1	0	0	RAN OFF ROAD	RAN OFF ROAD RIGHT	DARK (NOT LIGHTED)	CLEAR	WET	\$5001 TO \$10000
4	6/16/2010	1746	1	1	0	RAN OFF ROAD	FOLLOWING TOO CLOSELY	DAYLIGHT	CLEAR	DRY	\$1001 TO \$2500
5	9/1/2010	1448	2	1	0	REAR END	BRAKE FAILURE OR DEFECTIVE	DAYLIGHT	RAIN	WET	\$1001 TO \$2500
6	3/21/2011	0857	2	0	0	REAR END	OTHER (DRIVER) - EXPLAIN IN NARRATIVE	DAYLIGHT	CLEAR	DRY	\$1001 TO \$2500
7	5/26/2011	1649	1	0	0	RAN OFF ROAD	SPEED TOO FAST FOR WEATHER CONDITIONS	DAYLIGHT	RAIN	WET	\$1001 TO \$2500
8	10/16/2011	0249	1	0	0	RAN OFF ROAD	RAN OFF ROAD RIGHT	DARK (LIGHTED)	CLEAR	DRY	\$2501 TO \$5000
9	11/3/2011	1548	1	0	0	RAN OFF ROAD	SPEED TOO FAST FOR WEATHER CONDITIONS	DAYLIGHT	RAIN	WET	\$2501 TO \$5000
10	11/3/2011	1626	2	0	0	REAR END	SPEED TOO FAST FOR WEATHER CONDITIONS	DAYLIGHT	RAIN	WET	\$5001 TO \$10000
11	12/18/2011	0510	1	0	0	RAN OFF ROAD	OTHER (DRIVER) - EXPLAIN IN NARRATIVE	DARK (LIGHTED)	CLEAR	DRY	\$5001 TO \$10000
12	1/12/2012	1621	2	0	0	RIGHT ANGLE	LEFT OF CENTER	DAWN/DUSK	SNOW	ICE	\$5001 TO \$10000
13	1/17/2012	0850	2	0	0	REAR END	SPEED TOO FAST FOR WEATHER CONDITIONS	DAYLIGHT	CLOUDY	WET	\$1001 TO \$2500
14	2/17/2013	1547	2	0	0	RIGHT ANGLE	FAILURE TO YIELD RIGHT OF WAY	DAYLIGHT	CLEAR	DRY	\$2501 TO \$5000
15	10/7/2013	1449	2	0	0	RIGHT ANGLE	FAILURE TO YIELD RIGHT OF WAY	DAYLIGHT	CLEAR	DRY	\$10001 TO \$25000
16	11/28/2013	1214	2	0	0	SAME DIRECTION SIDESWIPE	BRAKE FAILURE OR DEFECTIVE	DAYLIGHT	CLEAR	DRY	\$2501 TO \$5000
17	3/2/2014	1649	2	0	0	RIGHT ANGLE	ROADWAY SURFACE CONDITION	DAYLIGHT	CLOUDY	ICE	\$10001 TO \$25000
18	3/2/2014	1731	2	0	0	RIGHT ANGLE	ROADWAY SURFACE CONDITION	DAYLIGHT	CLOUDY	ICE	\$5001 TO \$10000
19	3/3/2014	0845	1	0	0	RAN OFF ROAD	SPEED TOO FAST FOR WEATHER CONDITIONS	DAYLIGHT	CLEAR	ICE	\$2501 TO \$5000
20	8/28/2014	0035	1	1	0	RAN OFF ROAD	DISREGARD SIGNAL/REG SIGN	DARK (LIGHTED)	CLEAR	DRY	\$10001 TO \$25000
21	2/2/2015	1521	2	0	0	REAR END	FAILURE TO YIELD RIGHT OF WAY	DAYLIGHT	CLEAR	DRY	\$2501 TO \$5000

General Summary

Number of Crashes	21
Property Damage Only	16
Injury Crashes	5
Fatalities	0

Light Condition

Daylight	16
Dark (Lighted)	3
Dark (Not Lighted)	1
Dawn/Dusk	1

Manner of Collision

Ran Off Road	9
Rear End	6
Right Angle	5
Same Direction Sideswipe	1

Weather Condition

Clear	11
Rain	5
Cloudy	4
Snow	1

Primary Factor

Speed too Fast	6
Failure to Yield Right of Way	3
Following Too Closely	2
Ran Off Road Right	2
Brake Failure	2
Other, Explain in Narrative	2
Roadway Surface Condition	2
Disregard Signal/Reg Sign	1
Left of Center	1

Surface Condition

Dry	9
Wet	8
Ice	5

Damage Estimate

\$10001 TO \$25000	3
\$5001 TO \$10000	5
\$2501 TO \$5000	7
\$1001 TO \$2500	6

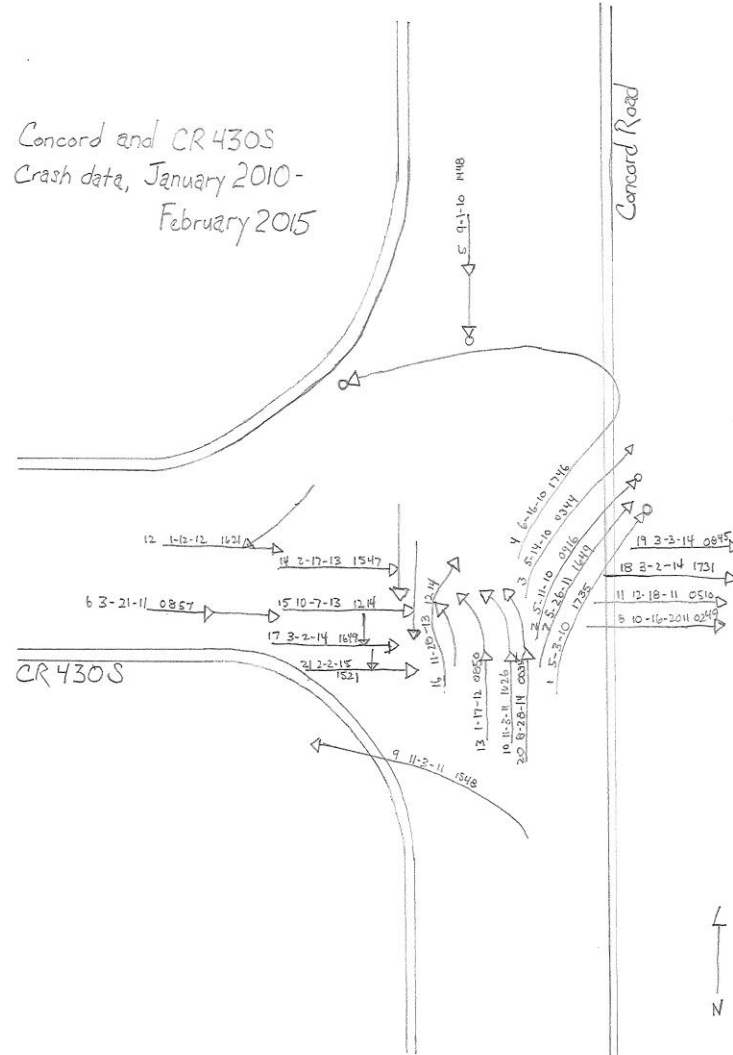
Summary of Crash Data

Concord and CR 430S

Crash Data Summary

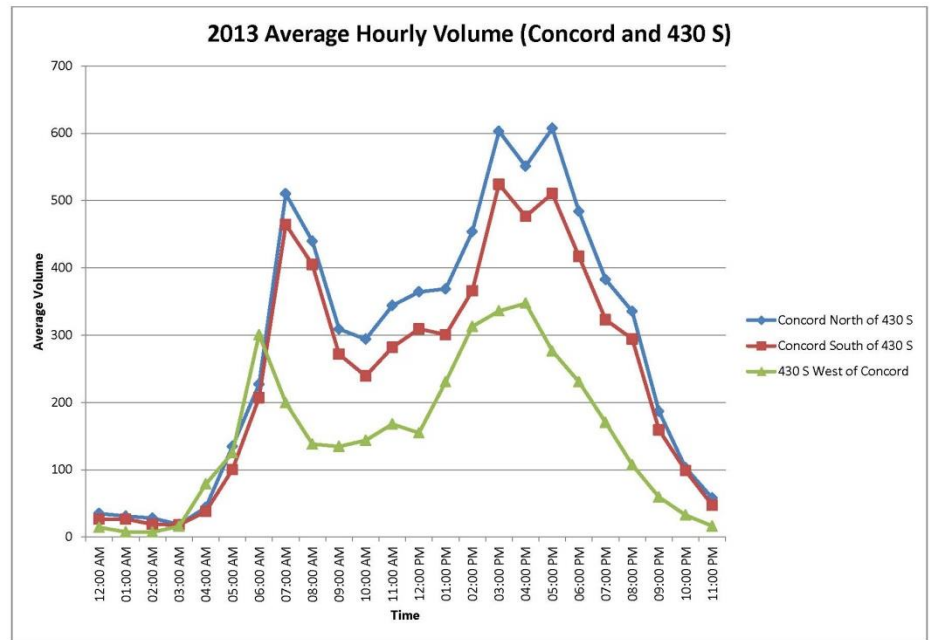
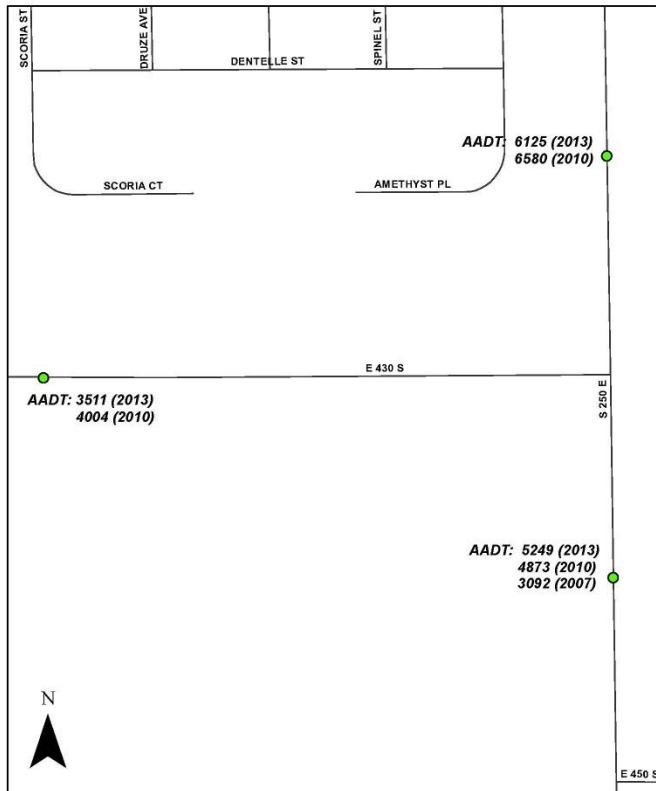
Crash Number	Summary
1	Vehicle traveling too fast for wet pavement. Tried to avoid stopped vehicle in front of them, ran off road and hit rock.
2	Did not see vehicles turn signal in front of them. Swerved, ran off road and hit utility box.
3	Car in front stopped suddenly. Vehicle swerved and ran off road.
4	Driver left scene (intoxicated). Vehicle went off road, over corrected and flipped vehicle at least once.
5	Rear end collision. Brakes failed.
6	Rear-end collision. Vehicle started to go but stopped suddenly. Vehicle behind rear ended the vehicle.
7	A vehicle was stopped to turn left. The other vehicle tried to stop, slid on wet pavement and went off the road. Hit utility box and rock.
8	Driver did not see stop sign, went through intersection and struck tree on other side of road.
9	Vehicle tried to stop for school bus. Brakes failed, went left and hit guide wires and utility pole.
10	A vehicle was stopped to turn left. The other vehicle was unable to stop and rear-ended vehicle.
11	Drove through intersection and hit rock. Driver fled scene.
12	Vehicle turned too wide and hit stopped vehicle. Road was ice covered and slick.
13	Vehicle crested hill and did not see stopped vehicle until too late. Rear-ended stopped vehicle.
14	Vehicle pulled out and struck southbound vehicle.
15	Vehicle pulled out and struck southbound vehicle. The report did state that the driver of vehicle did look before turning.
16	Vehicle was making a left turn. Second vehicles brakes failed and then they tried to pass left of the first vehicle.
17	Vehicle slid into intersection due to ice on road.
18	Vehicle hit ice, went through intersection and hit guide wire.
19	Vehicle went through intersection and hit guide wire and tree.
20	A vehicle was stopped to turn left. Second vehicle did not see the stopped vehicle and rear-ended it.
21	Vehicle hit ice and slid into intersection and hit southbound vehicle.

Collision Diagram

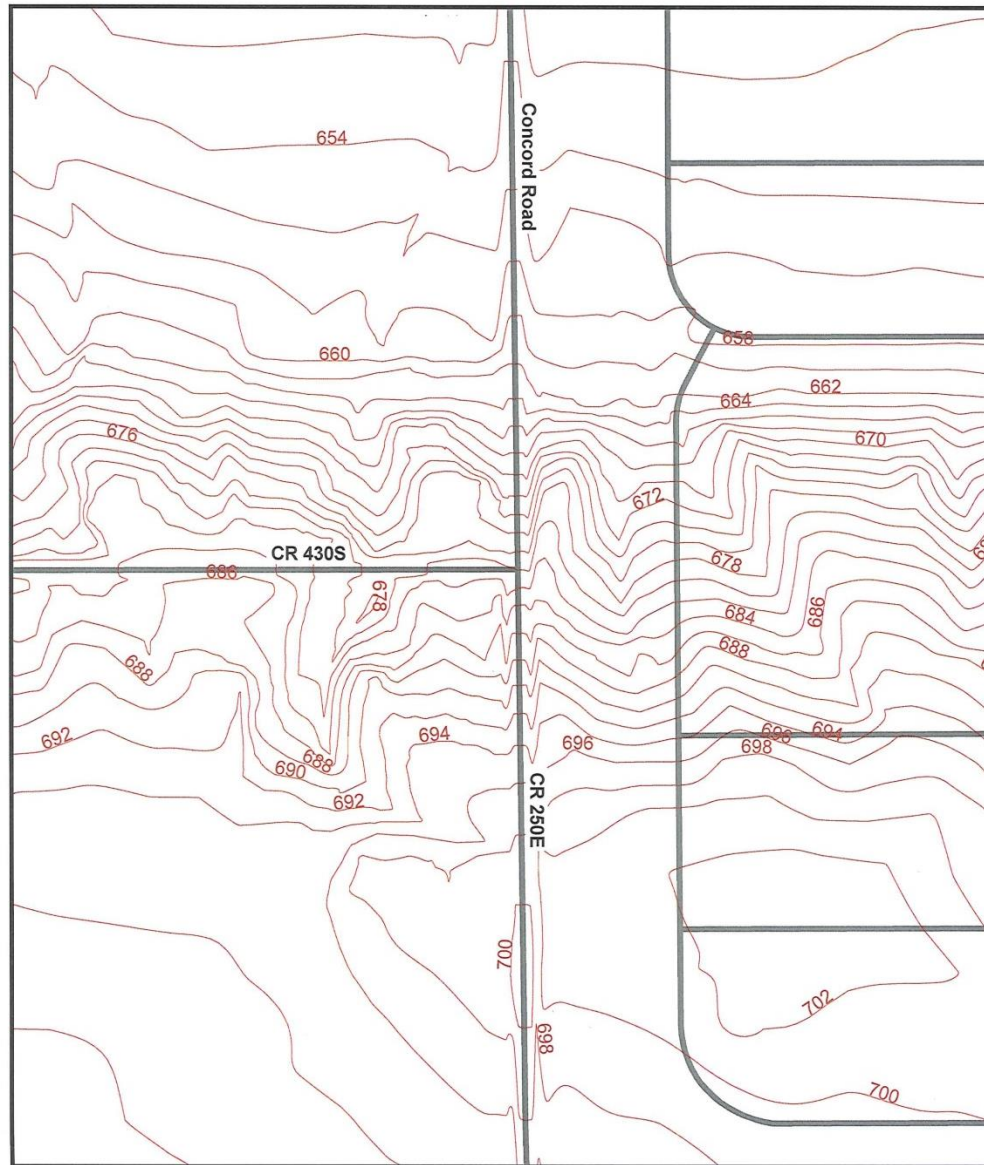


Traffic Volume

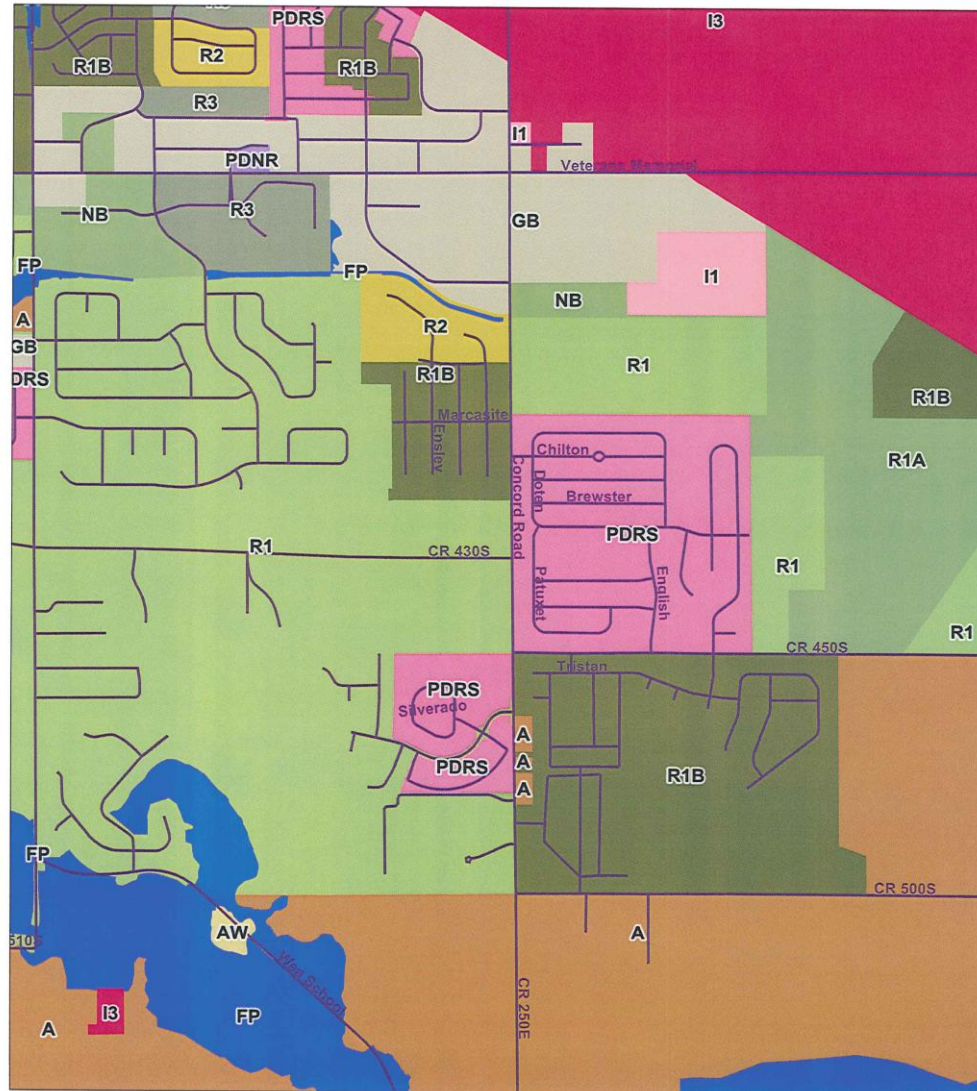
Traffic Counts



Topography



Land Uses in the Area



Step 3: Select RSA Team

Team Members:

Jim Hawley, Former APC Executive Director

Capt. Brian Sterner, County Sheriff's Department

Greg Haltom, Transportation Director for Tip. School Corp.

Mike Parks, Traffic Supervisor, Tip. Co. Highway Dept.

Dave Buck, PE, Public Works Director, City of West Lafayette

Laura Slusher, PE, LTAP, HELPERS Project Manager

Jim Knapp, PE, Senior Civil Engineer, Purdue Facilities Planning

Tim Stroshine, EIT, Transportation Planner, APC

Jon Fricker, PE, Professor at Purdue, Civil Engineering

Step 4: Site Visit

June 18, 2015



Check List

- One for each team member
- 14 Categories:
 - Moving Lanes,
 - Turn Lanes,
 - Driveways,
 - Shoulders,
 - Horizontal/Vertical Alignment,
 - Road Markings/ Delineation,
 - Light Conditions,
 - Signage,
 - Sight Distance,
 - Skid Resistance,
 - Pavement Defects,
 - Drainage,
 - Barriers, and
 - Driver Behavior
- 64 Questions

CR 250 E (Concord Rd) and CR 430 S Page: 1 of 3

Road Safety Audit Check List

Facility Type: Rural two lane "T" intersection

Date: June 18, 2015 Time: _____ Weather: _____

	Yes	Maybe	No or N/A
Moving Lanes			
Lane widths are inadequate			
Number of lanes is inadequate for traffic			
Lanes abruptly end			
Auxiliary / Turning Lanes			
Inadequate advance warning of lane drop			
Auxiliary or turning lane too short			
Auxiliary or turning lane not properly marked			
Auxiliary or turning lane needed			
Driveways			
Driveways too close to intersection			
Driveways too closely spaced			
Inadequate visibility of driveways			
Shoulders			
Shoulder widths are inadequate			
Inappropriate shoulder surface			
Shoulders are poorly maintained			
Insufficient contrast of shoulder			
Drop off at edge of pavement			
Horizontal and Vertical Alignment			
Horizontal or vertical alignment reduces visibility			
Abrupt change in elevation			
Inadequate visibility at sag or crest curves			
Inadequate or excessive superelevation			
Curves may cause sliding in adverse weather			
Pavement Markings/Delineation			
Pavement markings not clearly visible			
Necessary pavement markings not present			
Too many pavement markings present			
Pavement markings inappropriate for location			
Old/conflicting pavement marking not removed			
Inadequate retroreflectivity of existing markings			
Road markings lack sufficient contrast with pavement surface			

Step 5: Group Discussion

- Held at County Office Building
- Discussion of Observations and Analysis
- Develop both Short-Term and Long-Term Recommendations.

Short Term Solutions

Short-Term Recommendations – To minimize rear end and right angle crashes the County should take steps to increase driver awareness of the intersection. In the near term significantly improving sight distances is not possible. However, additional driver information about the intersection ahead and slowing left turning vehicles is recommended to improve driver predictability and reduce crashes.

Concord Road (CR 250E)

Greater intersection awareness is needed for north bound vehicles because of inadequate sight distance which is caused by a hill that obstructs the view of the intersection. Advanced intersection signing on the south leg is recommended to provide greater awareness of the approaching intersection.

CR 430S

Greater intersection awareness is needed for east bound vehicles. This can be accomplished with the installation of advanced intersection signing, possibly a stop bar, a larger Stop sign and a double arrow on the far side of the intersection. Vegetation on the west side of the intersection should be trimmed, particularly the northwest corner where it may be in the public right-of-way.

Long Term Solutions

Long-Term Recommendations – To reduce the rear end and run off the road type crashes the County should make significant improvements to the intersections and approaches. These measures will improve sight distance, remove the slower turning traffic from the higher speed through traffic and reduce crashes.

Concord Road (CR 250E)

To address the rear end crashes the intersection should be reconstructed. The hill on the south approach should be removed to improve sight distance and a passing blister should be constructed on the east side of the intersection. The lane and minimal shoulder widths should be widened to current standards and the new pavement should be a high friction surface to address the slippery pavement crash history. The recently completed Lafayette Trail Master Plan recommends a multi-use trail on this section of CR 250W and provisions for the trail should be included in any reconstruction.

Long Term Solutions

CR 430S

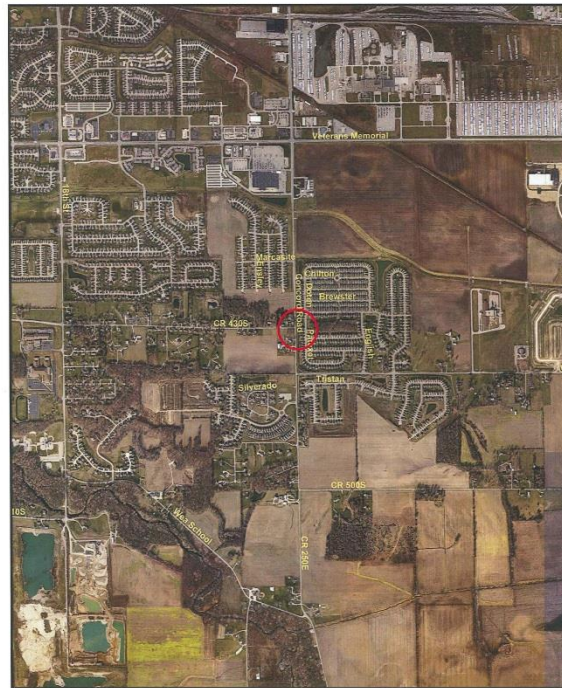
The road needs to be reconstructed so the approach eliminates the slight dip and road undulations just prior to the intersection. The lane and minimal shoulder widths should be widened to current standards and the new pavement should be a high friction surface to address the slippery pavement crash history. The 2040 Metropolitan Transportation Plan recommends a trail on CR430S that would connect the proposed trail on CR250E to the elementary and middle school a mile to the west. Provisions for the trail should be included in any reconstruction.

Relocation of CR 430S

In addition to reconstructing the intersection in its current location, there was discussion of completely relocating the intersection a half mile south so it would line up with CR450S on the east side of CR250E. This would eliminate the need to reconstruct the existing intersection, allow for the construction of a new intersection in a location with better sight distance and provide a better network for future traffic in this growing area. Depending upon available funding realigning CR430S should be considered by Tippecanoe County.

Step 6: Prepare Report

Road Safety Audit
County Road 250 E and County Road 430 S
Area Plan Commission of Tippecanoe County
July 2015



Step 7: Approval from INDOT for use of Federal HSIP funds

**Request for HSIP Funds by
Tippecanoe County**

Project: Improvements to the Concord Road (CR
250E) and CR 430S Intersection

Submitted by the Area Plan Commission of Tippecanoe County
September 2015

INDOT Project Eligibility Requirements

1) *Address a Strategic Highway Safety Plan Emphasis Area*
Emphasis Area 2, Intersection Crashes

2) *Needs Analysis*
Road Safety Analysis

3) *Financial Analysis*
Develop Cost Estimates for PE, RW & CN
Calculate Benefit to Cost Ratio (HAT Software)

4) *Project Development Timeline*

5) *Maintenance of HSIP Installation*

6) *Post Construction Safety Evaluation*

7) *Cover Letter*

Step 8: Secure Federal HSIP Funds

*The Fiscal Year 2016-2019
Transportation Improvement Program*

The Area Plan Commission of Tippecanoe County

20 North 3rd Street
Lafayette, IN 47901
www.tippecanoe.in.gov/apc

The image is framed by a black border. At the top and bottom of the frame are two identical rows of eight yellow diamond-shaped traffic signs. From left to right, the signs are: a left-turn arrow, a red circle with a black arrow pointing up, a bicycle, a double vertical arrow pointing up and down, a pedestrian, a car with a wavy line underneath, a diamond with the text 'DIVIDED ROAD', and a plus sign.

Summary of Steps

- Step 1: Identify Location
- Step 2: Compiled Reference Data
- Step 3: Select RSA Team
- Step 4: Performed Site Review
- Step 5: Group Discussion & Problem Identification
- Step 6: Prepare Report
- Step 7: INDOT Submittal
- Step 8: Funding

Resources Available

FWHA Web Site:

www.safety.fhwa.dot.gov/rsa/

LTAP HELPERS Web Site

rebar.ecn.purdue.edu/LTAP1/HELPERS/HelpersAbout.aspx

The screenshot shows the FHWA Road Safety Audits (RSA) web page. The header includes the FHWA logo and navigation links. The main content area is titled "Road Safety Audits (RSA)" and features a "Program Contact" sidebar with information for Becky Croze and K. Craig Allred. The main text provides an "Executive Summary" of RSAs, explaining their purpose and the questions they aim to answer. It includes a list of questions and a section on public agency involvement. Two side-by-side photographs illustrate an intersection "Before" and "After" a road safety audit, showing changes in traffic signal placement and pavement markings.

The screenshot shows the Indiana LTAP HELPERS web page. The header features the Indiana LTAP logo and navigation links. The main content area is titled "What is HELPERS?" and provides a detailed description of the program, its goals, and the types of projects it supports. It also lists eligible agencies and provides contact information for further assistance.

NCHRP Synthesis 336, NCHRP

http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_336.pdf



Questions?

Presentation Information

Reports are available on APC web site:

- Tippecanoe County – Area Plan Commission – Transportation Planning - Crashes
- RSA Audit
 - INDOT Safety Committee Request

Presenter Contact Information:

- Opal Kuhl, Executive Director, Tippecanoe County Highway Department
okuhl@tippecanoe.in.gov
- Greg Haltom, Transportation Director, Tippecanoe School Corporation
glhaltom@tsc.k12.in.us
- Doug Poad, Senior Transportation Planner, Area Plan Commission
dpoad@tippecanoe.in.gov