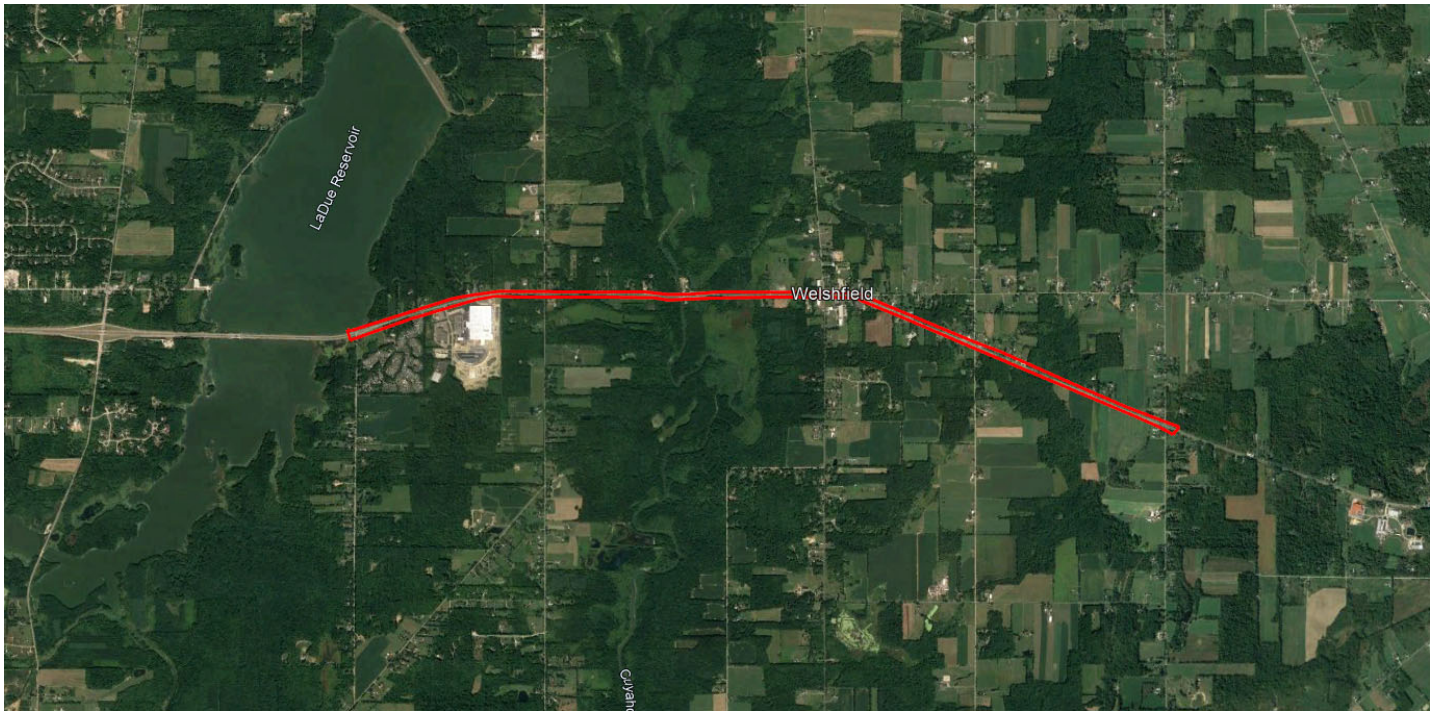
GEA 422 (US 422 near Welshfield) TOAST Study



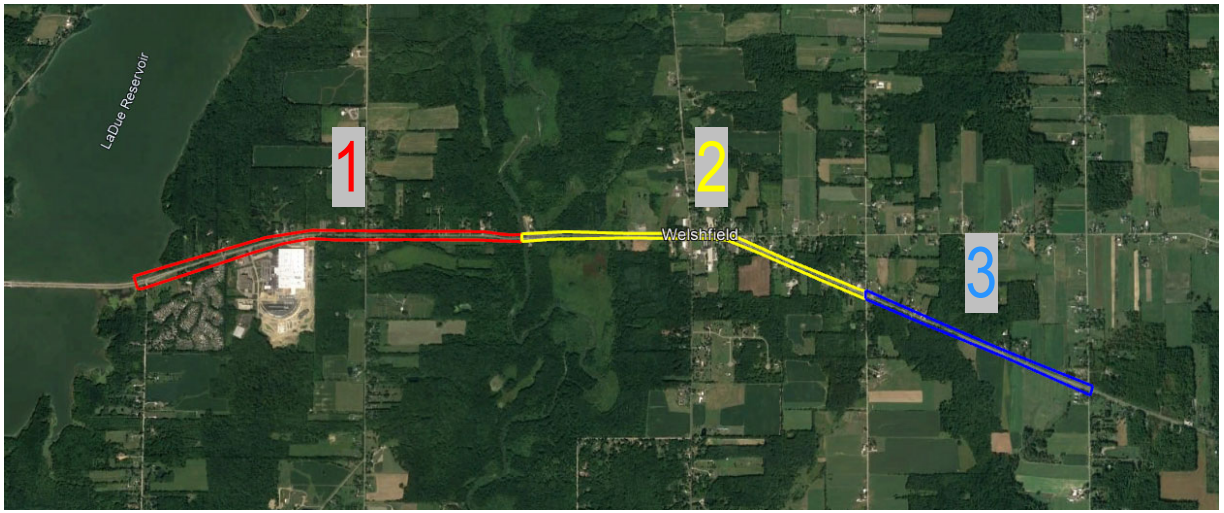
2/4/2022

Presentation Overview

- TSMO/TOAST Overview
- Traffic Analysis
- Safety Analysis
- Corridor Needs
- Potential Improvements
- Recommendations

TSMO/TOAST Scores

	County	Route	Beg Log	End Log	# Ellis Projects	Bottlenecks Multiplier: 2.5		Travel Time Performance Multiplier: 2		TSMO Safety Multiplier: 1.5		Volume Per Lane Multiplier: 1.5		Freight Corridors Multiplier: 1		Incident Clearance Multiplier: 0.75		Secondary Crashes Multiplier: 0.75	
						Impact Factor	Score	TTP %	Score	Crash Impact Factor	Score	# Veh	Score	% Trucks	Score	Minutes	Score	%	Score
1	GEA	422	10.53	12.26	0	13569	6	64%	0	73.5	1	9365	3	10.7%	6	2,681	1	0%	10
2	GEA	422	12.26	13.89	0	11450	7	71%	1	15.3	3	8304	3	11.7%	6	465	5	0%	10
3	GEA	422	13.89	16.38	0	7639	8	88%	6	14.8	3	5225	5	12.8%	5	1,282	2	5%	9



TSMO/TOAST Scores

- **TSMO Safety: Score 1-3**
- **Incident Clearance: Score 1-5**
- **Volume Per Lane: Score 3-5**
- **Travel Time Performance: Score 0-6**
- Freight Corridors: Score 5-6
- Bottlenecks: Score 6-8
- Secondary Crashes: Score 9-10

TRAFFIC ANALYSIS

US-422 Capacity Checks

- 2019 AADT from TMMS
  - 16,000 to 17,100
- Planning Level of Service 'E'

Potential Countermeasures:

- Spot 4-Lane or 3-Lane Widening

TABLE 3

Generalized **Annual Average Daily** Volumes for Florida's Rural Undeveloped Areas **and** Developed Areas Less Than 5,000 Population[1]

January 2020

INTERRUPTED FLOW FACILITIES

STATE SIGNALIZED ARTERIALS

Lanes	Median	B	C	D	E
2	Undivided	*	12,900	14,200	**
4	Divided	*	29,300	30,400	**
6	Divided	*	45,200	45,800	**

Non-State Signalized Roadway Adjustments

(Alter corresponding state volumes by the indicated percent.)

Non-State Signalized Roadways - 10%

Median & Turn Lane Adjustments

Lanes	Median	Exclusive Left Lanes	Exclusive Right Lanes	Adjustment Factors
2	Divided	Yes	No	+5%
2	Undivided	No	No	-20%
Multi	Undivided	Yes	No	-5%
Multi	Undivided	No	No	-25%
–	–	–	Yes	+ 5%

One-Way Facility Adjustment

Multiply the corresponding two-directional volumes in this table by 0.6

BICYCLE MODE[2]

(Multiply vehicle volumes shown below by number of directional roadway lanes to determine two-way maximum service volumes.)

Rural Undeveloped

Paved Shoulder/Bicycle Lane Coverage	B	C	D	E

UNINTERRUPTED FLOW FACILITIES

FREEWAYS

Lanes	B	C	D	E
4	34,800	48,000	56,700	63,200
6	48,900	69,000	82,600	94,800
8	62,900	90,400	108,400	126,400

Freeway Adjustments

Auxiliary Lanes Present in Both Directions + 20,000

UNINTERRUPTED FLOW HIGHWAYS

Rural Undeveloped

Lanes	Median	B	C	D	E
2	Undivided	4,600	8,600	14,000	28,500
4	Divided	31,200	44,900	55,700	62,700
6	Divided	46,800	67,600	83,500	94,200

Developed Areas

Lanes	Median	B	C	D	E
2	Undivided	10,300	15,700	21,300	28,500
4	Divided	29,300	42,300	54,000	61,600
6	Divided	44,000	63,600	81,200	92,400

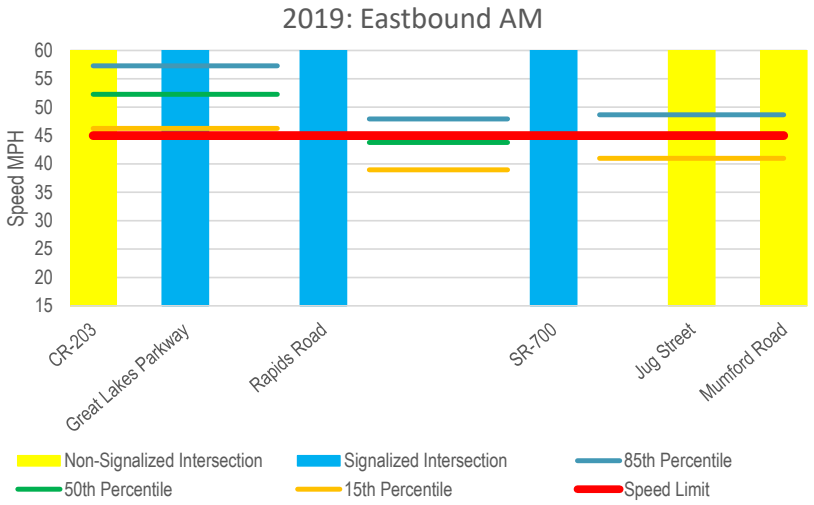
Passing Lane Adjustments

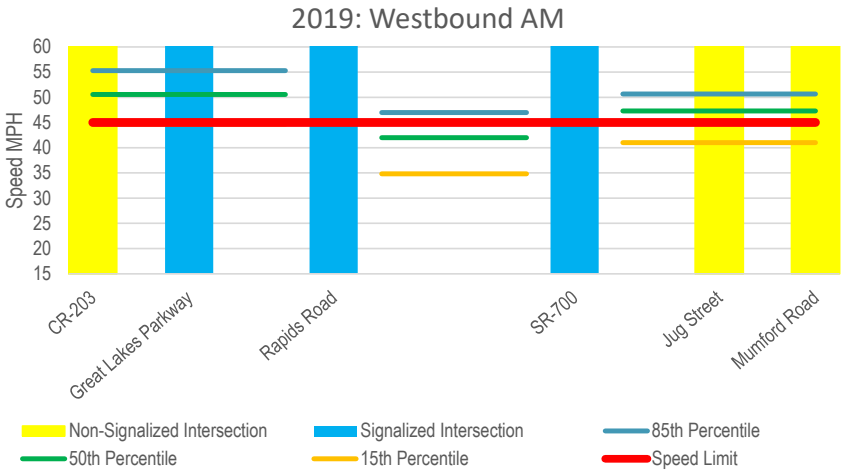
Alter LOS B-D volumes in proportion to the passing lane length to the highway segment length

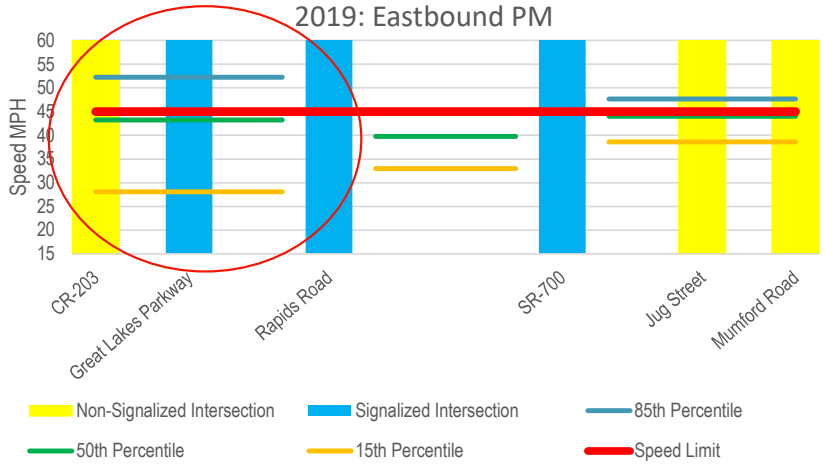
Uninterrupted Flow Highway Adjustments

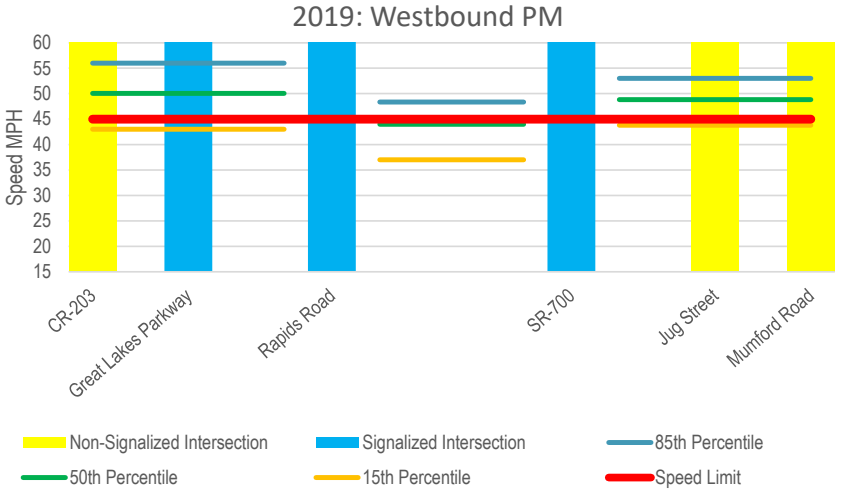
Lanes	Median	Exclusive left lanes	Adjustment factors
2	Divided	Yes	+5%
Multi	Undivided	Yes	-5%
Multi	Undivided	No	-25%

US-422 Speed Profiles (and Travel Reliability)









US-422 O-D Patterns for Daily Volume

Westbound	
Trips to US-422 West Project Limits	
From Trips	Percent of Trips
US-422 Through Volume	58.1%
SR-700 (N Leg)	10.8%
Rapids (N Leg)	6.7%
SR-700 (S Leg)	6.4%
Great Lakes (S Leg)	4.5%
CR-203 (S Leg)	4.3%
CR-207 (E Leg)	2.8%
Rapids (S Leg)	2.6%
Mumford (S Leg)	1.3%
Highland (S Leg)	0.8%
Mumford (N Leg)	0.7%
Jug (N Leg)	0.6%
Jug (S Leg)	0.4%

Eastbound	
Trips TO US-422 East Project Limits	
From Trips	Percent of Trips
US-422 Through Volume	85.2%
Great Lakes (S Leg)	6.8%
SR-700 (S Leg)	1.8%
Mumford (N Leg)	1.4%
Highland (S Leg)	0.9%
Rapids (S Leg)	0.8%
SR-700 (N Leg)	0.7%
Mumford (S Leg)	0.6%
Jug (N Leg)	0.6%
Rapids (N Leg)	0.4%
SR-207 (E Leg)	0.3%
Jug (S Leg)	0.3%
CR-203 (S Leg)	0.3%

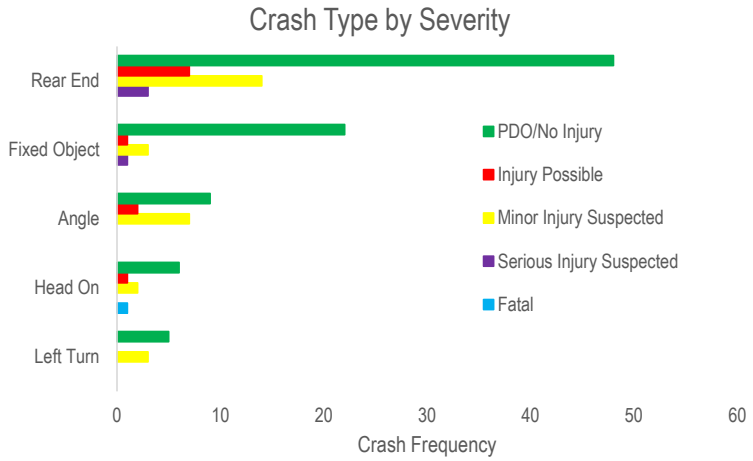
- 60% to 85% of Traffic is Through Volume
  - Trends are Similar for AM and PM Peak
- Rapids Road Intersection and SR-700 Intersection has Significant Turning Volume

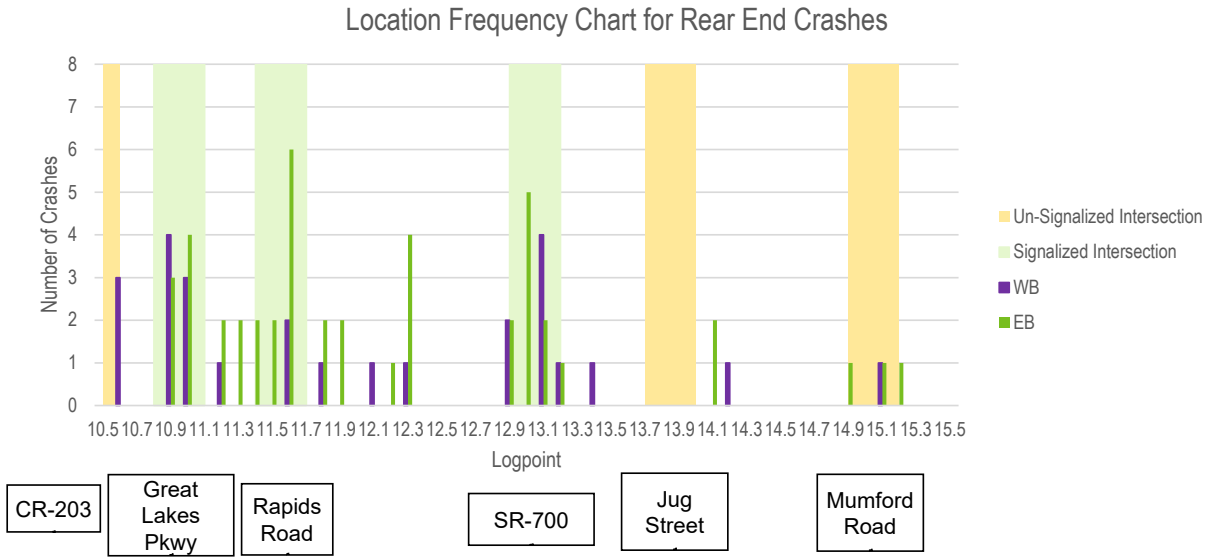
SAFETY ANALYSIS

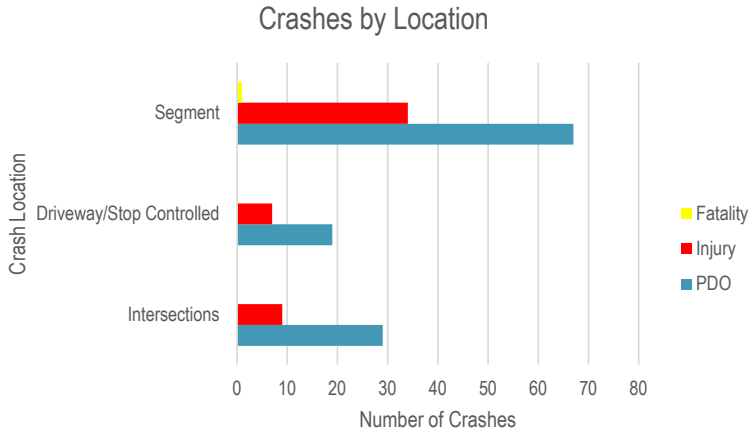
Crash Analysis Overview

Crash Data: Years 2017 - 2019

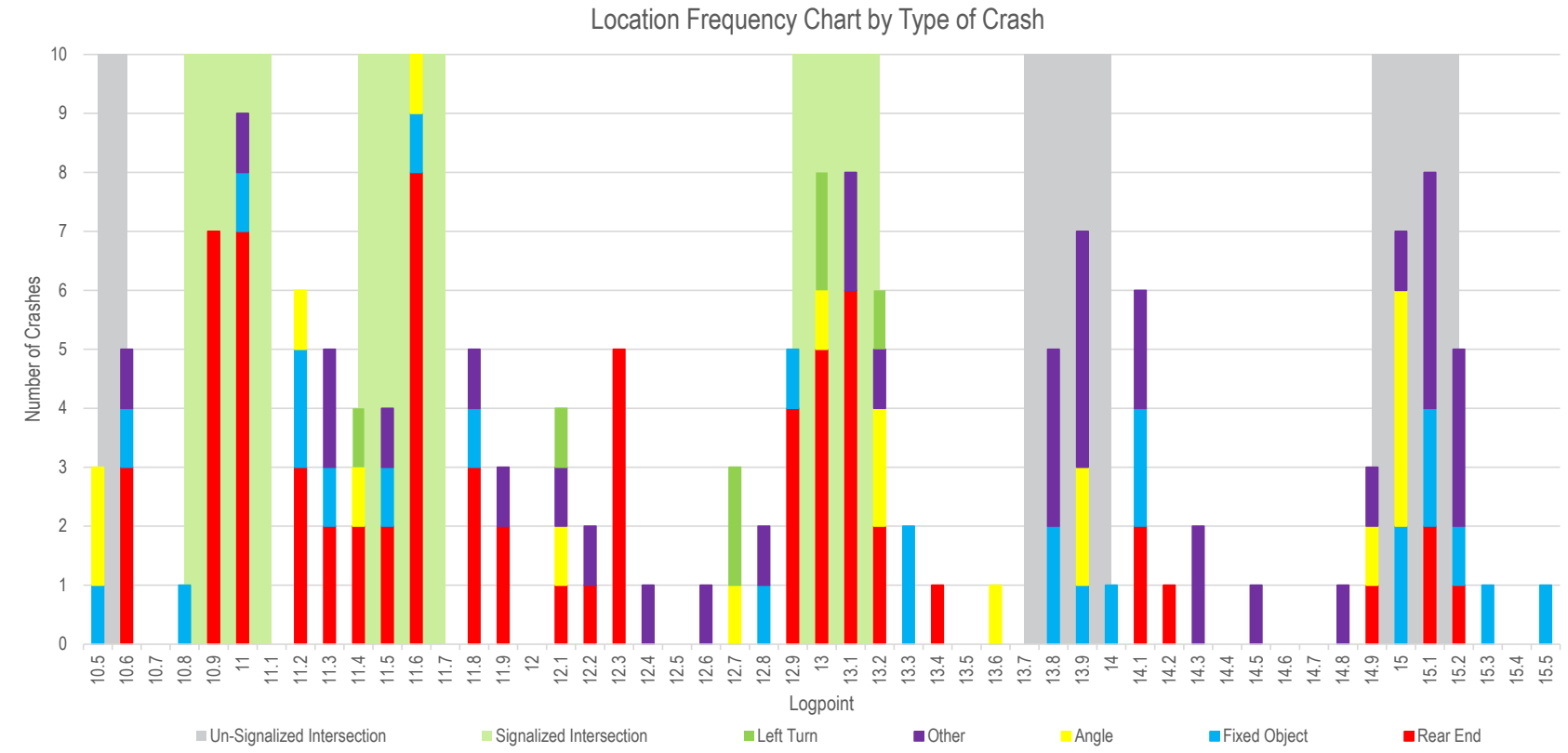
Total Crashes Crash Type	(1) Fatal	(2) Serious Injury Suspected	(3) Minor Injury Suspected	(4) Injury Possible	(5) PDO/No Injury	Grand Total
Rear End	0	3	14	7	48	72
Fixed Object	0	1	3	1	22	27
Angle	0	0	7	2	9	18
Sideswipe - Passing	0	0	1	0	9	10
Head On	1	0	2	1	6	10
Left Turn	0	0	3	0	5	8
Animal	0	0	0	0	6	6
Other (Categories < 5)	0	1	2	2	10	15
Grand Total	1	5	26	12	96	166







Crash By Logpoint



CR-203

Great Lakes Pkwy

Rapids Road

SR-700

Jug Street

Mumford Road

Corridor Needs

- Reduce Crashes
- Improvement In Incident Clearance
- Additional Capacity For Volume Per Lane
- Improve Travel Reliability through Rapids Road

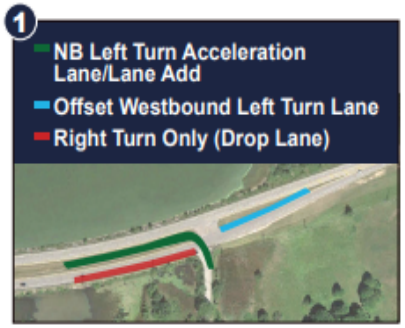
Potential Short-Term Countermeasures

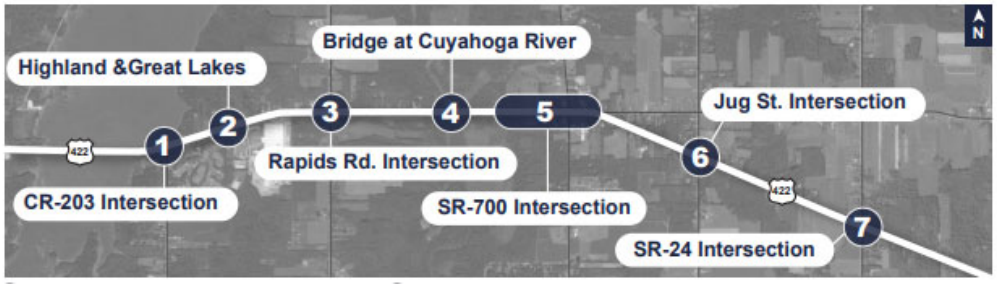
- Sub Segments with 4-Lane or 3-Lane Widening (or Reversible Lane)
- Exclusive Turn Lanes at Select Intersections
- Shoulder Widening
- Access Management
- Curve/Intersection Warning System
- Freeway Service Patrols / Traffic Incident Management
- Environmental Detection – Dynamic Message Signs
- Signal Timing Adjustments (Local and Interconnect)

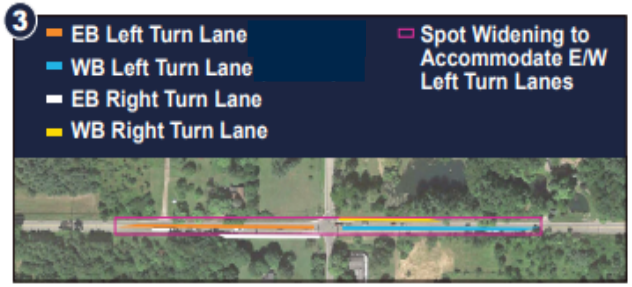
Potential Short-Term Countermeasures

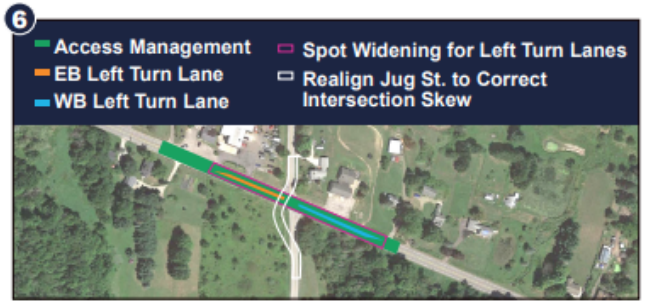
- Sub Segments with 4-Lane or 3-Lane Widening (or Reversible Lane)
- Exclusive Turn Lanes at Select Intersections
- Shoulder Widening
- Access Management
- Curve/Intersection Warning System
- Freeway Service Patrols / Traffic Incident Management
- Environmental Detection – Dynamic Message Signs
- Signal Timing Adjustments (Local and Interconnect)
- Climbing Lane
- Spot Intersection Geometric Improvements

Overview of Potential Improvements









Analysis Notes:

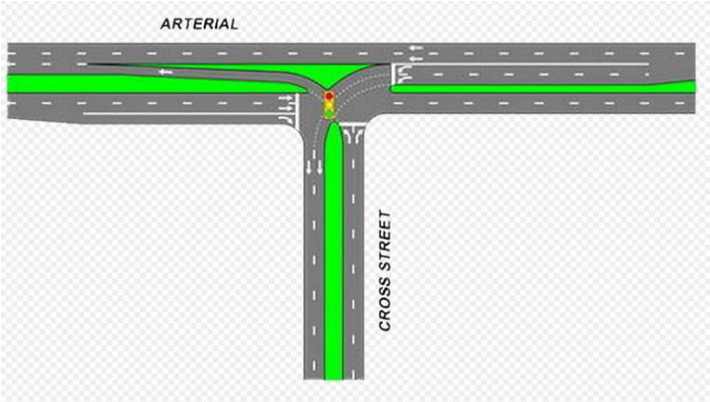
- Delay Calculations Represent AM/PM Peak Hour Over A Year
- Aspects Of Cost Estimates
  - Pavement/Removal
  - Embankment/Excavation
  - Traffic Control (5%)
  - Drainage (5%)
  - Staged Construction (10%)
  - Mobilization (10%)
  - Contingency (30%)

Location 1:
CR-203/Shaw Road Intersection

		Year: 2021	Year: 2045
Crash Reduction	Injury Crashes	-0.16	-0.17
	PDO Crashes	-0.33	-0.36
Delay (Vehicle-Hours Per Year)		1353	2233

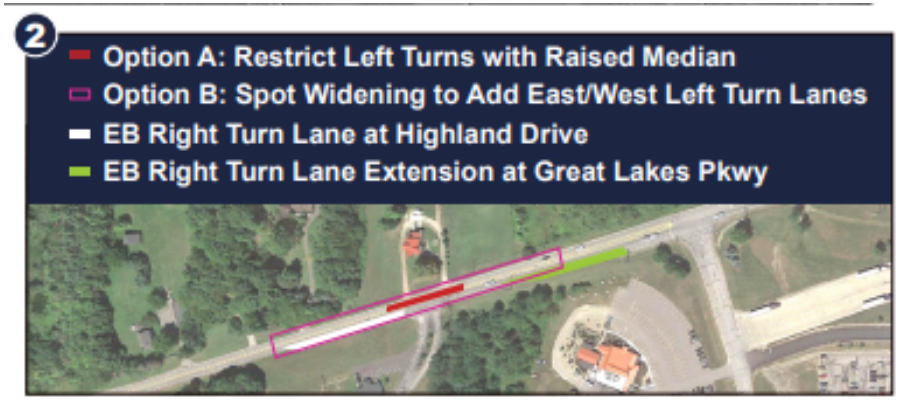
BCA:

- Cost: $485,000
- BCR
  - 10 Year: 1.17 : 1
  - 20 Year: 2.49 : 1
  - 25 Year: 3.20 : 1



*Example of NB Left Turn Acceleration Lane

Location 2:
Highland Drive & Great Lakes Pkwy Intersections
Option A: Prohibit Left Turns

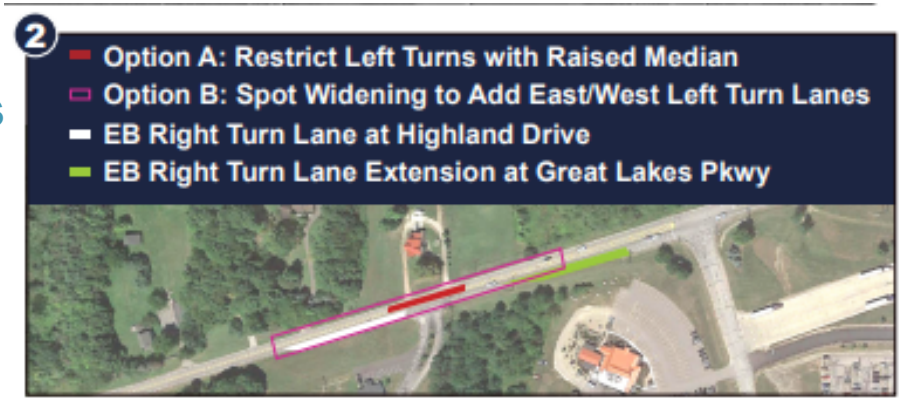


		Year: 2021	Year: 2045
Crash Reduction	Injury Crashes	-0.22	-0.25
	PDO Crashes	-0.47	-0.52
Delay (Vehicle-Hours Per Year)		-2299	-6406

- (Additional Delay at Shaw from traffic rerouting)

BCA:
- Cost: $190,000
- BCR
  - 10 Year: -0.59 : 1
  - 20 Year: -2.56 : 1
  - 25 Year: -4.06 : 1

Location 2:
Highland Drive & Great Lakes Pkwy Intersections
Option B: Right and Left Turn Lanes

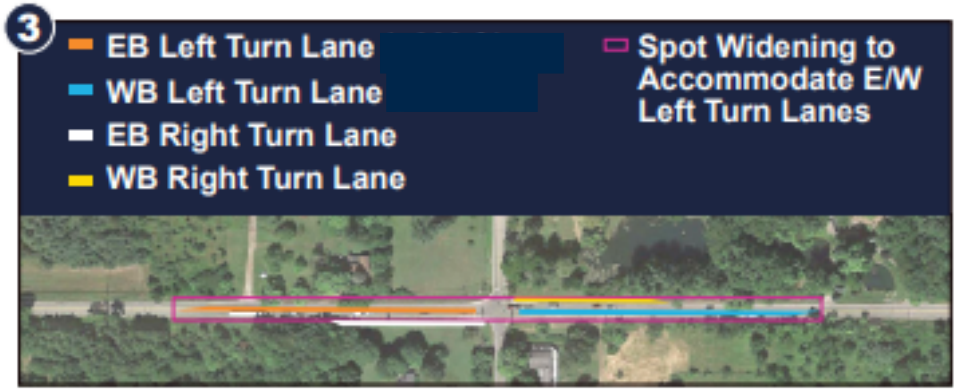


		Year: 2021	Year: 2045
Crash Reduction	Injury Crashes	-0.62	-0.67
	PDO Crashes	-1.29	-1.40
Delay (Vehicle-Hours Per Year)		88	185

BCA:

- Cost: $565,000
- BCR
  - 10 Year: 2.14 : 1
  - 20 Year: 4.35 : 1
  - 25 Year: 5.49 : 1

Location 3:
Rapids Road Intersection
Option A: Left Turn Lanes

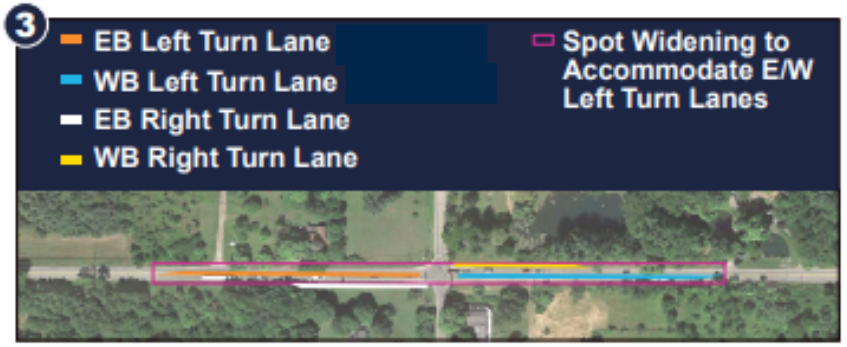


		Year: 2021	Year: 2045
Crash Reduction	Injury Crashes	-1.27	-1.35
	PDO Crashes	-3.85	-4.07
Delay (Vehicle-Hours Per Year)		891	1842

BCA:

- Cost: $345,000
- BCR
  - 10 Year: 6.29 : 1
  - 20 Year: 12.89 : 1
  - 25 Year: 16.31 : 1

Location 3:
Rapids Road Intersection
Option B: Left Turn and Right Turn Lanes

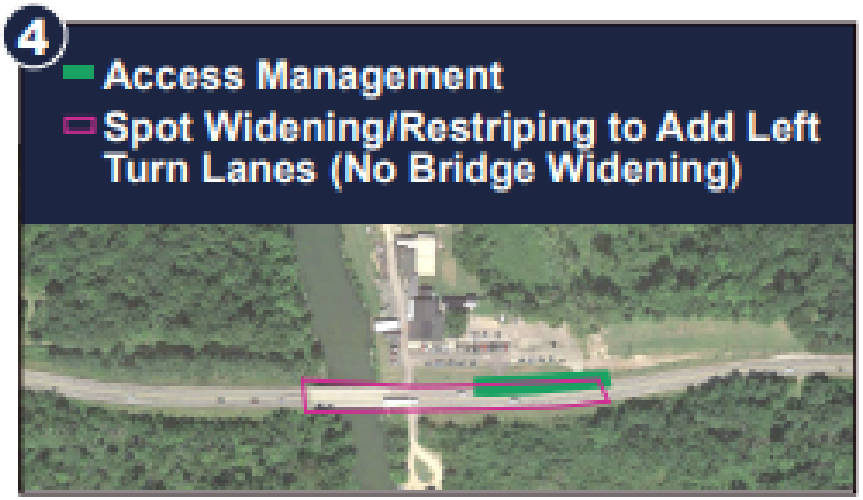


		Year: 2021	Year: 2045
Crash Reduction	Injury Crashes	-1.48	-1.56
	PDO Crashes	-4.47	-4.72
Delay (Vehicle-Hours Per Year)		991	2049

BCA:

- Cost: $655,000
- BCR
  - 10 Year: 3.84 : 1
  - 20 Year: 7.86 : 1
  - 25 Year: 9.94 : 1

Location 4:
Cuyahoga River
Access Management & TWLTL



		Year: 2021	Year: 2045
Crash Reduction	Injury Crashes	-0.02	-0.01
	PDO Crashes	-0.02	-0.02
Delay (Vehicle-Hours Per Year)		Not Quantified	Not Quantified

Curve and Driveway Warning: Alternative Countermeasure – Not Evaluated

BCA:

- Cost: $585,000
- BCR
  - 10 Year: 0.06 : 1
  - 20 Year: 0.11 : 1
  - 25 Year: 0.13 : 1

Location 5:
SR-700 & Nash Road
Access Management

		Year: 2021	Year: 2045
Crash Reduction	Injury Crashes	-0.09	-0.08
	PDO Crashes	-0.13	-0.11
Delay (Vehicle-Hours Per Year)		Not Quantified	Not Quantified

BCA:

- Cost: $515,000
- BCR
  - 10 Year: 0.34 : 1
  - 20 Year: 0.67 : 1
  - 25 Year: 0.82 : 1

*Cost includes Raised Median

Location 5:
SR-700 & Nash Road
Climbing Lane

		Year: 2021	Year: 2045
Crash Reduction	Injury Crashes	-0.28	-0.30
	PDO Crashes	-0.41	-0.46
Delay (Vehicle-Hours Per Year)		1635	1865

BCA:

- Cost: $1,215,000
- BCR
  - 10 Year: 0.72 : 1
  - 20 Year: 1.47 : 1
  - 25 Year: 1.86 : 1

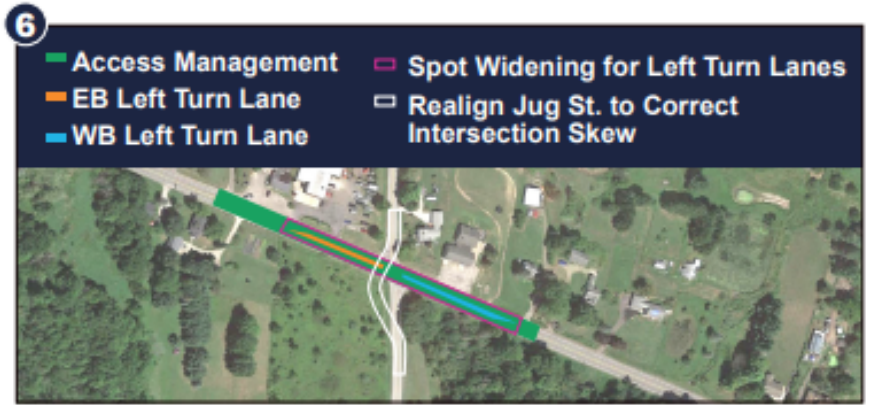
Location 6:
Jug Street
Access Management & Left Turn Lanes

		Year: 2021	Year: 2045
Crash Reduction	Injury Crashes	-0.34	-0.38
	PDO Crashes	-0.59	-0.66
Delay (Vehicle-Hours Per Year)		2	9

BCA:

- Cost: $1,020,000
- BCR
  - 10 Year: 0.69 : 1
  - 20 Year: 1.42 : 1
  - 25 Year: 1.80 : 1

Location 6:
Jug Street
Realign Intersection Skew

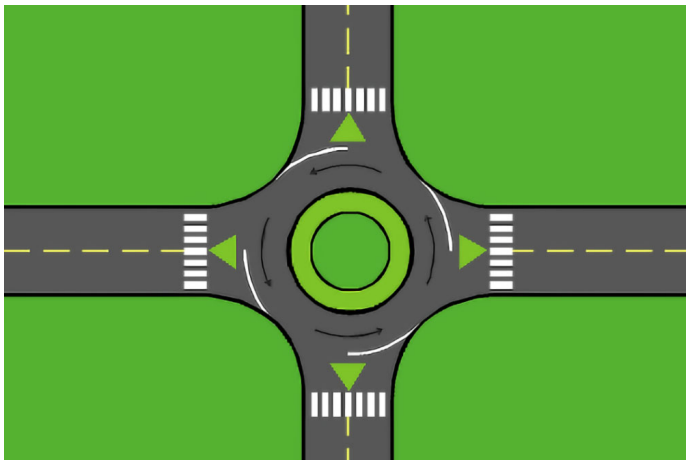


		Year: 2021	Year: 2045
Crash Reduction	Injury Crashes	-0.09	-0.10
	PDO Crashes	-0.15	-0.17
Delay (Vehicle-Hours Per Year)		0	0

BCA:

- $315,000
- BCR
  - 10 Year: 0.57 : 1
  - 20 Year: 1.16 : 1
  - 25 Year: 1.47 : 1

Location 6:
Jug Street
Roundabout



		Year: 2021	Year: 2045
Crash Reduction	Injury Crashes	-0.58	-0.65
	PDO Crashes	-0.54	-0.60
Delay (Vehicle-Hours Per Year)		66	-219

BCA:

- Cost: $1,500,000
- BCR
  - 10 Year: 0.79 : 1
  - 20 Year: 1.61 : 1
  - 25 Year: 2.03 : 1

Location 7:
Mumford Road
Three Lane Section

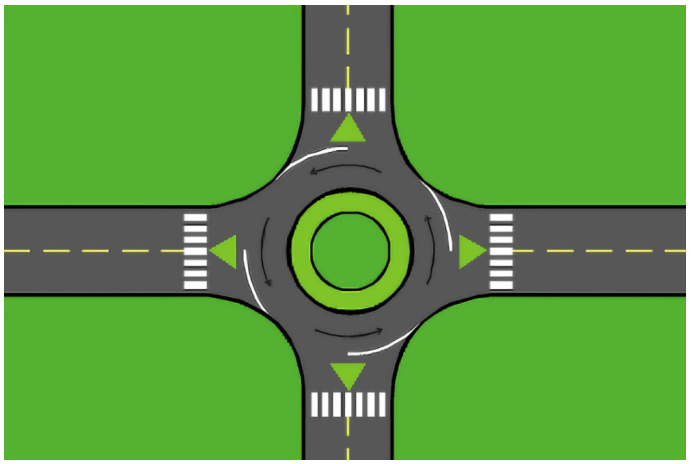
Benefits Of Three Lane Section

- Remove Transition From 2-lane To 4-lane Roadway Through Intersection
- Offset Left Turn Lane
- Reduce Distance Of Crossing Movements

BCA:

- Cost: $410,000

Location 7:
Mumford Road
Roundabout



		Year: 2021	Year: 2045
Crash Reduction	Injury Crashes	-0.60	-0.67
	PDO Crashes	-0.55	-0.62
Delay (Vehicle-Hours Per Year)		-243	-50

BCA:

- Cost: $1,500,000
- BCR
  - 10 Year: 0.83 : 1
  - 20 Year: 1.70 : 1
  - 25 Year: 2.14 : 1

US-422 System Improvements

Shoulder Widening

- Average Shoulder Width: 2-3 Feet
- Corridor Length: 4.5 Miles
- Cost: $ Per Mile?

Traffic Incident Management / Freeway Service Patrol (FSP)

- Program Life Span: 10 Years
- Cost: $2,000,000 – Cost Used in Previous TOAST Studies
- Annual Benefit: $425,000
- BCR: 2.125 : 1

Benefit-Cost Analysis: US-422

Location	Countermeasure	Costs	Benefits (cost/yr) (10 yrs)	B/C
CR-203 / Shaw Road	Intersection Improvements	$ 485,000.00	$ 56,644.39	1.17
Highland Drive	Restrict Left Turns with Raised Median	$ 190,000.00	$ (11,226.82)	-0.59
Highland Drive & Great Lakes Pkwy	Right and Left Turn Lanes	$ 565,000.00	$ 120,655.93	2.14
Rapids Road	Left Turn Lanes	$ 345,000.00	$ 216,892.36	6.29
Rapids Road	Left Turn Lanes & Right Turn Lanes	$ 655,000.00	$ 251,210.67	3.84
Cuyahoga River	Access Management	$ 585,000.00	$ 3,242.63	0.06
SR-700 & Nash Road	Access Management	$ 515,000.00	$ 17,583.03	0.34
SR-700 & Nash Road	Climbing Lane	$ 1,215,000.00	$ 87,372.01	0.72
Jug Street	Access Management & Left Turn Lanes	$ 1,020,000.00	$ 70,843.24	0.69
Jug Street	Realign Intersection Skew	$ 315,000.00	$ 17,904.99	0.57
Mumford Road	Three Lane Section	$ 410,000.00	N/A	N/A
Jug Street	Roundabout	$ 1,500,000.00	$ 119,095.03	0.79
Mumford Road	Roundabout	$ 1,500,000.00	$ 125,144.24	0.83
US-422	Shoulder Widening	$ -	$ -	0.00
US-422	Traffic Incident Management / Freeway Service Patrol (FSP)	$ 2,000,000.00	$ 425,000.00	2.13

Benefit-Cost Analysis: US-422

Location	Countermeasure	Costs	Benefits (cost/yr) (10 yrs)	B/C
Rapids Road	Left Turn Lanes	$ 345,000.00	$ 216,892.36	6.29
Rapids Road	Left Turn Lanes & Right Turn Lanes	$ 655,000.00	$ 251,210.67	3.84
Highland Drive & Great Lakes Pkwy	Right and Left Turn Lanes	$ 565,000.00	$ 120,655.93	2.14
US-422	Traffic Incident Management / Freeway Service Patrol (FSP)	$ 2,000,000.00	$ 425,000.00	2.13
CR-203 / Shaw Road	Intersection Improvements	$ 485,000.00	$ 56,644.39	1.17
Mumford Road	Roundabout	$ 1,500,000.00	$ 125,144.24	0.83
Jug Street	Roundabout	$ 1,500,000.00	$ 119,095.03	0.79
SR-700 & Nash Road	Climbing Lane	$ 1,215,000.00	$ 87,372.01	0.72
Jug Street	Access Management & Left Turn Lanes	$ 1,020,000.00	$ 70,843.24	0.69
Jug Street	Realign Intersection Skew	$ 315,000.00	$ 17,904.99	0.57
SR-700 & Nash Road	Access Management	$ 515,000.00	$ 17,583.03	0.34
Cuyahoga River	Access Management	$ 585,000.00	$ 3,242.63	0.06
US-422	Shoulder Widening	$ -	$ -	0.00
Mumford Road	Three Lane Section	$ 410,000.00	N/A	N/A
Highland Drive	Restrict Left Turns with Raised Median	$ 190,000.00	$ (11,226.82)	-0.59