

Appendix E – Alternatives Screening Analysis

ROUTE 460 (ORANGE AVE/CHALLENGER AVE) OPERATIONAL IMPROVEMENTS STUDY

Draft Alternatives and Screening Analysis

February 11, 2020




AGENDA

- **Introductions**
- **Feedback from November 2019 Public Information Meeting #1**
- **Route 460 Alternatives Screening**
 - Traffic operations
 - Safety conditions
 - Alternatives considered
 - Proposed improvements
- **Public Information Meeting #2**
- **SMART SCALE Pre-Application**
- **Next Steps**

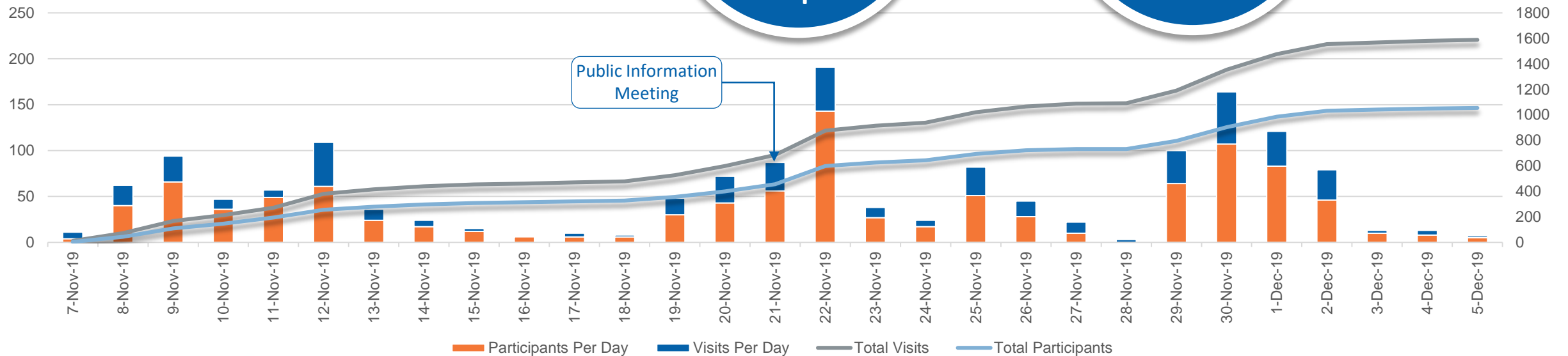
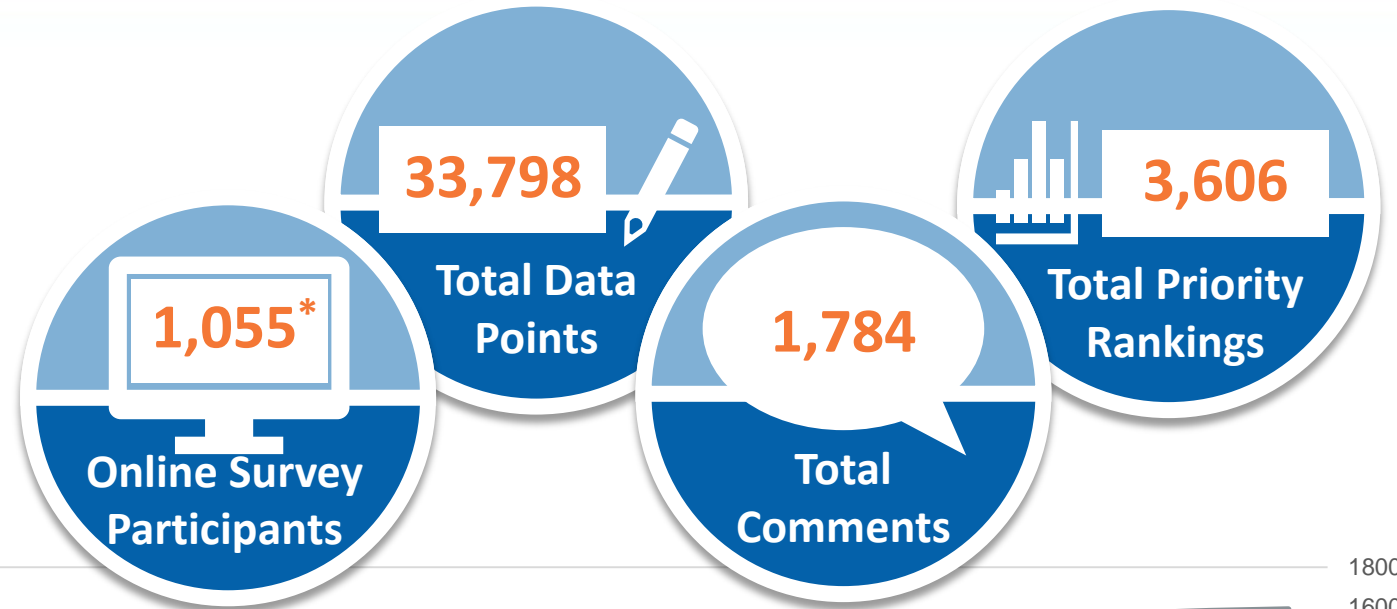
NOVEMBER 21, 2019 PUBLIC INFORMATION MEETING SUMMARY OF METROQUEST SURVEY RESPONSES

SURVEY SUMMARY

Overview

 MetroQuest
Online Survey

Conducted November 7 – December 5, 2019

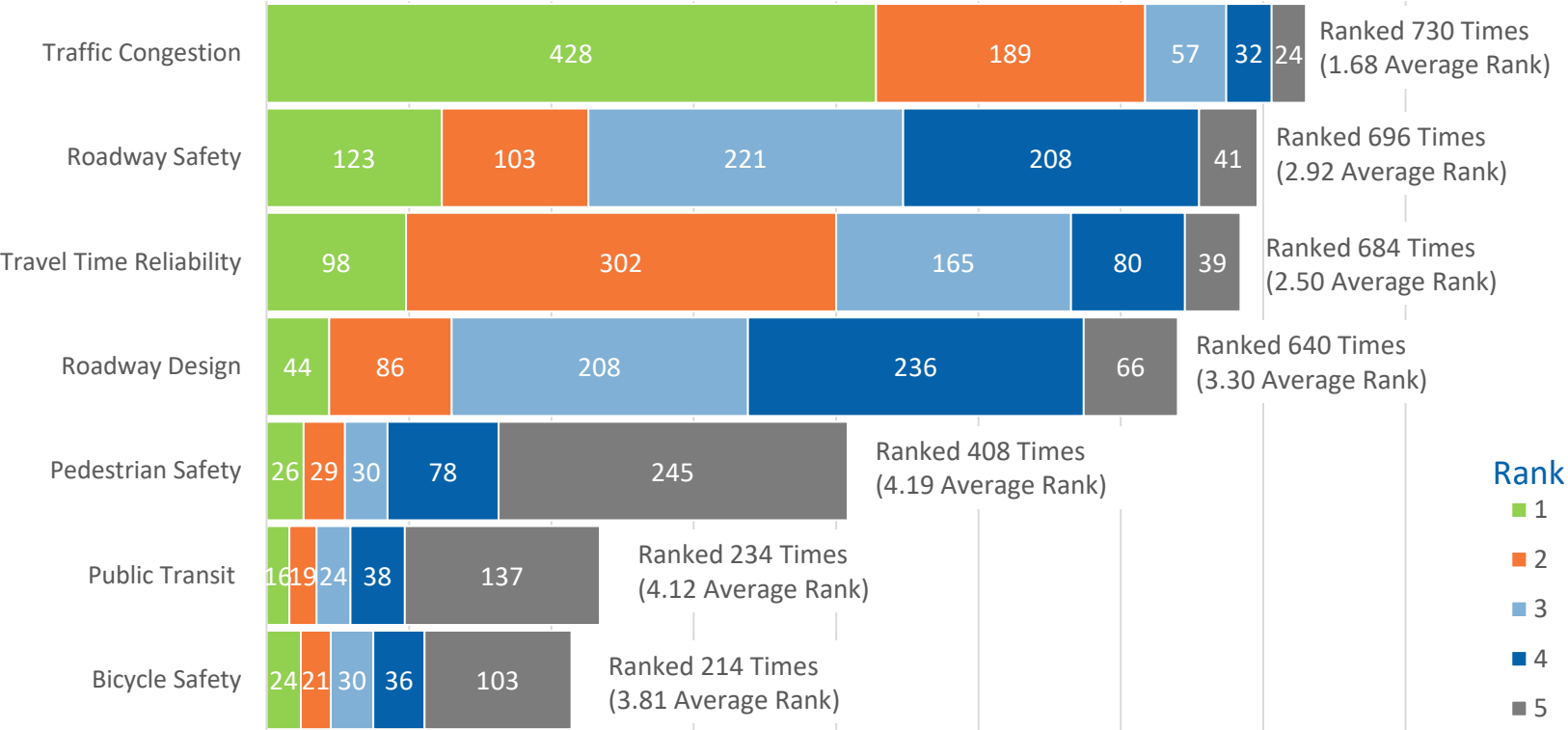


* Includes 908 survey participants with unique Internet Protocol (IP) addresses.

SURVEY SUMMARY – ISSUES AND OPPORTUNITIES



Priority Rankings



* Note that the highest rank is 1, so lower rankings and averages are better than higher ones.

SURVEY SUMMARY – CORRIDOR USE AND ISSUES

Corridor Use and Frequency

WELCOME

2

3

Corridor Use and Issues

What to do

Next Task

4

5

MAP MARKERS

WRAP UP

Corridor Use and Frequency

Congestion

Mobility

Safety

Multimodal

Corridor Use and Frequency

How often do you travel this section of Route 460?

Daily

A few times per week

A few times per month

A few times per year

Less than one time per year

What is/are the reason(s) you travel along this corridor? (check all that apply)

☐ Home

☐ Work

☐ School

☐ Shopping / Errands

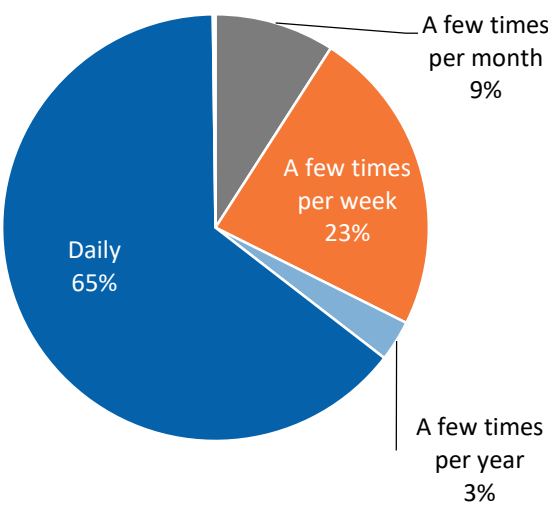
☐ Entertainment

☐ Passing thru to a destination outside of the study area

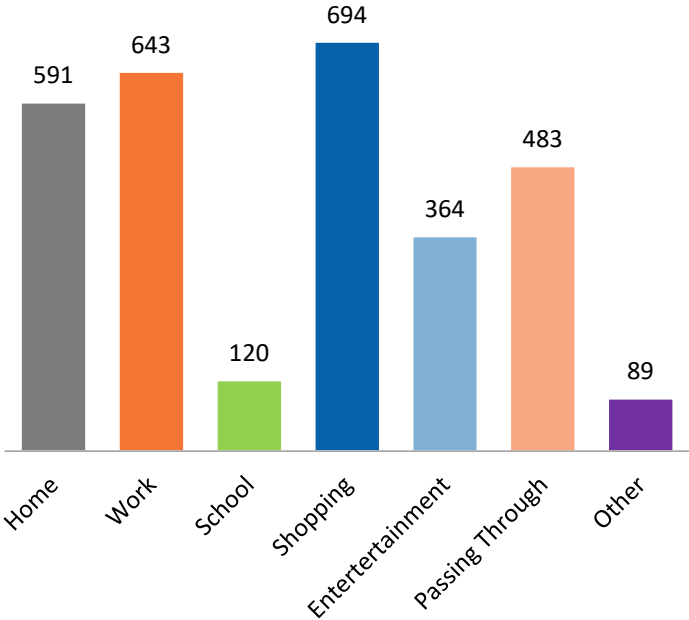
☐ Other

Next

How often do you travel this section of Route 460?



What is/are the reason(s) you travel along this corridor?



SURVEY SUMMARY – CORRIDOR USE AND ISSUES

Congestion

WELCOME

2

3

Corridor Use and Issues

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MAP MARKERS

WRAP UP

Corridor Use and Frequency

Congestion

Mobility

Safety

Multimodal

Congestion

When do you typically experience congestion when using the corridor? (check all that apply)

☐ Weekday mornings

☐ Weekday midday

☐ Weekday afternoons

☐ Weekday evenings / nights

☐ Saturday

☐ Sunday

In which travel direction do you typically experience congestion? (check all that apply)

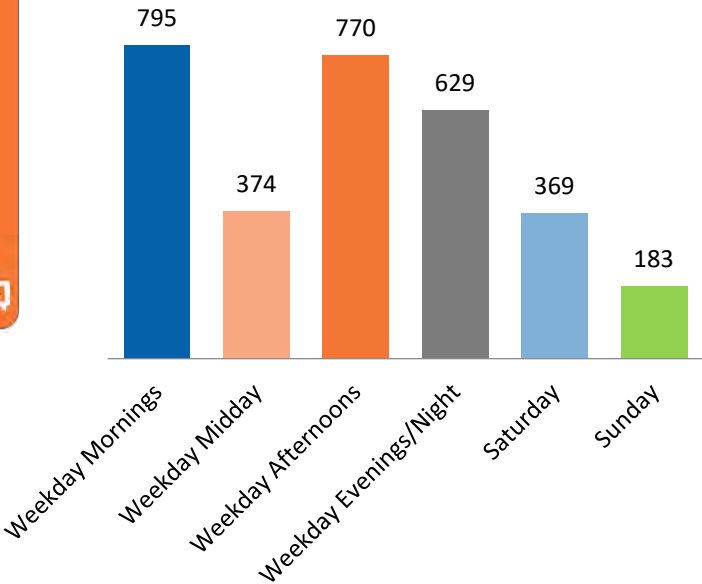
☐ Eastbound (toward Bonsack/Botetourt/Bedford)

☐ Westbound (toward City of Roanoke/Interstate-581)

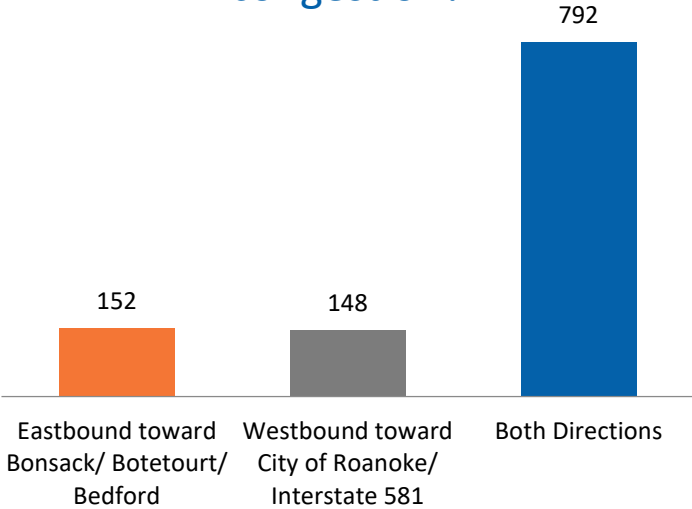
☐ Both directions

Next

When do you typically experience congestion when using the corridor?



In which travel direction do you typically experience congestion?



SURVEY SUMMARY – CORRIDOR USE AND ISSUES

Mobility

WELCOME

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MAP MARKERS

WRAP UP

Corridor Use and Frequency

Congestion

Mobility

Safety

Multimodal

Mobility

What mobility issues do you typically experience when using this corridor? (check all that apply)

☐ Difficulty when walking within the corridor and/or crossing Route 460

☐ Challenges in riding a bicycle in the corridor

☐ Difficulty making left turns

☐ Lack of turn lanes

☐ Difficulty accessing businesses

☐ Vehicles blocking entrances

☐ Difficulty merging where the six lanes are reduced to four

☐ Lack of traffic signal coordination/stopping at every traffic signal

☐ Frequent accidents restricting travel lanes

☐ Other

When do you experience mobility issues? (check all that apply)

☐ Weekday mornings

☐ Weekday midday

☐ Weekday afternoons

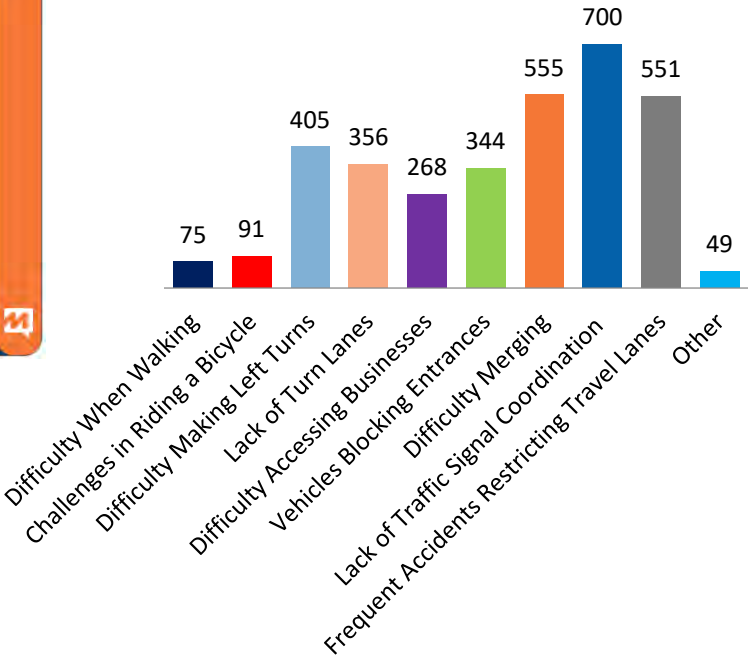
☐ Weekday evenings / nights

☐ Saturday

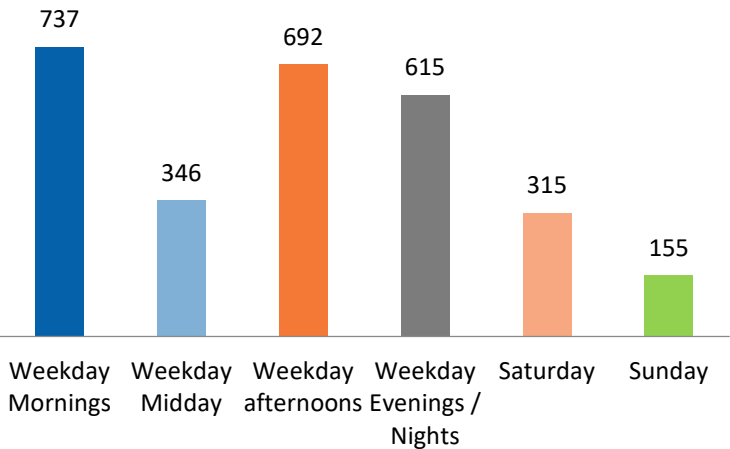
☐ Sunday

Next

What mobility issues do you typically experience when using this corridor?



When do you experience mobility issues?



SURVEY SUMMARY – CORRIDOR USE AND ISSUES

Safety

WELCOME

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MAP MARKERS

WRAP UP

Corridor Use and Frequency

Congestion

Mobility

Safety

Multimodal

Safety

What safety issues do you typically experience when using this corridor? (check all that apply)

☐ Speeding ☐ Congestion ☐ Aggressive or distracted driving

☐ Lack of pedestrian or bicycle facilities (e.g., sidewalks, crosswalks, signals)

☐ Roadside hazards ☐ Road maintenance

☐ Signs and pavement markings ☐ Other

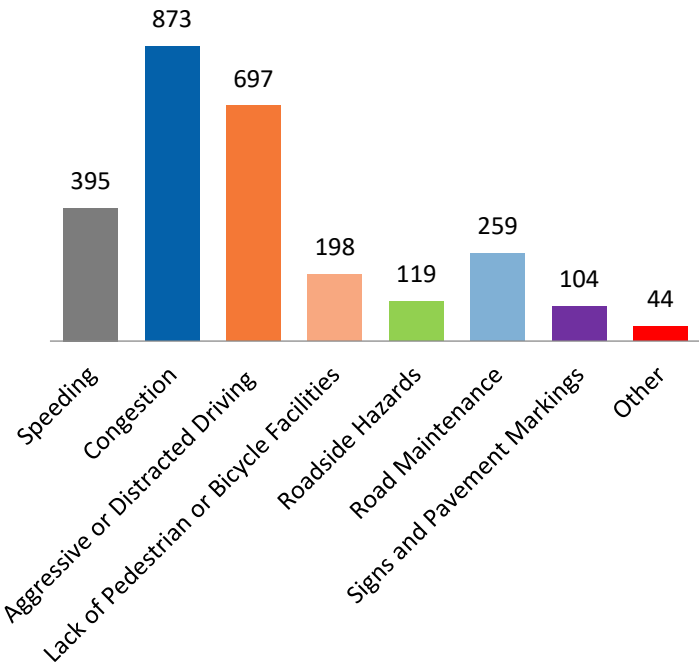
When do you typically experience safety issues along this corridor? (check all that apply)

☐ Weekday mornings ☐ Weekday midday ☐ Weekday afternoons

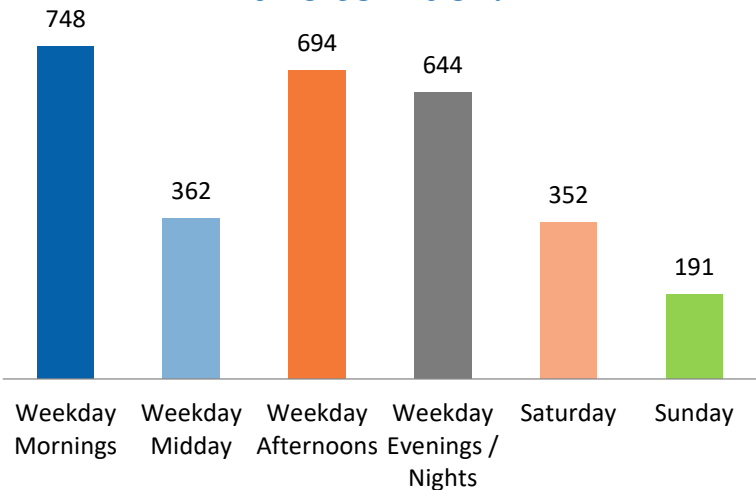
☐ Weekday evenings / nights ☐ Saturday ☐ Sunday

Next

What safety issues do you typically experience when using this corridor?



When do you typically experience safety issues along this corridor?



SURVEY SUMMARY – CORRIDOR USE AND ISSUES

Multimodal

WELCOME

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Corridor Use and Issues

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MAP MARKERS

WRAP UP

Corridor Use and Frequency

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Mobility

Safety

Multimodal

Multimodal

What mode(s) of travel do you use when traveling along this corridor? (check all that apply)

☐ Personal vehicle ☐ Taxi / Uber / Lyft ☐ Carpool / vanpool

☐ Valley Metro bus ☐ School bus ☐ Truck or commercial vehicle

☐ Walking ☐ Bicycling ☐ Other

What multimodal facilities are needed along this corridor? (check all that apply)

☐ Sidewalks / crosswalks / pedestrian signals

☐ Shared-use path (hard surface path for pedestrians and cyclist to share)

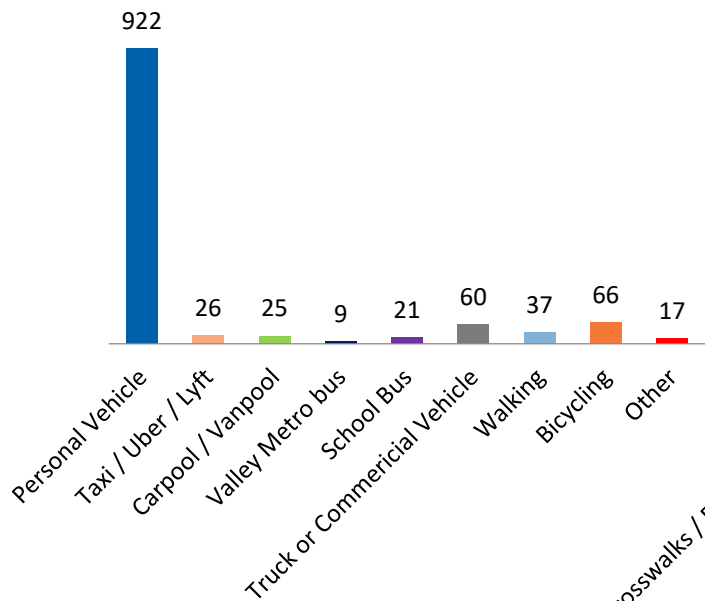
☐ Bicycle lanes ☐ More frequent Valley Metro transit service

☐ Valley Metro transit service along the entire corridor ☐ Bus shelters

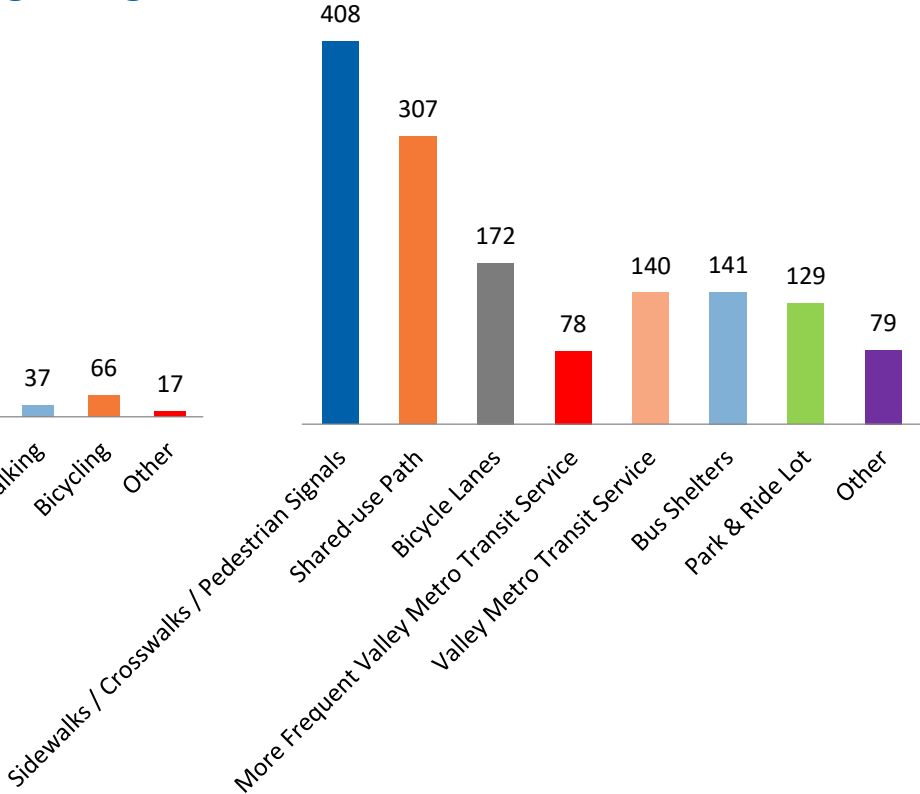
☐ Park & ride lot ☐ Other

Next

What mode(s) of travel do you use when traveling along this corridor?



What multimodal facilities are needed along this corridor?

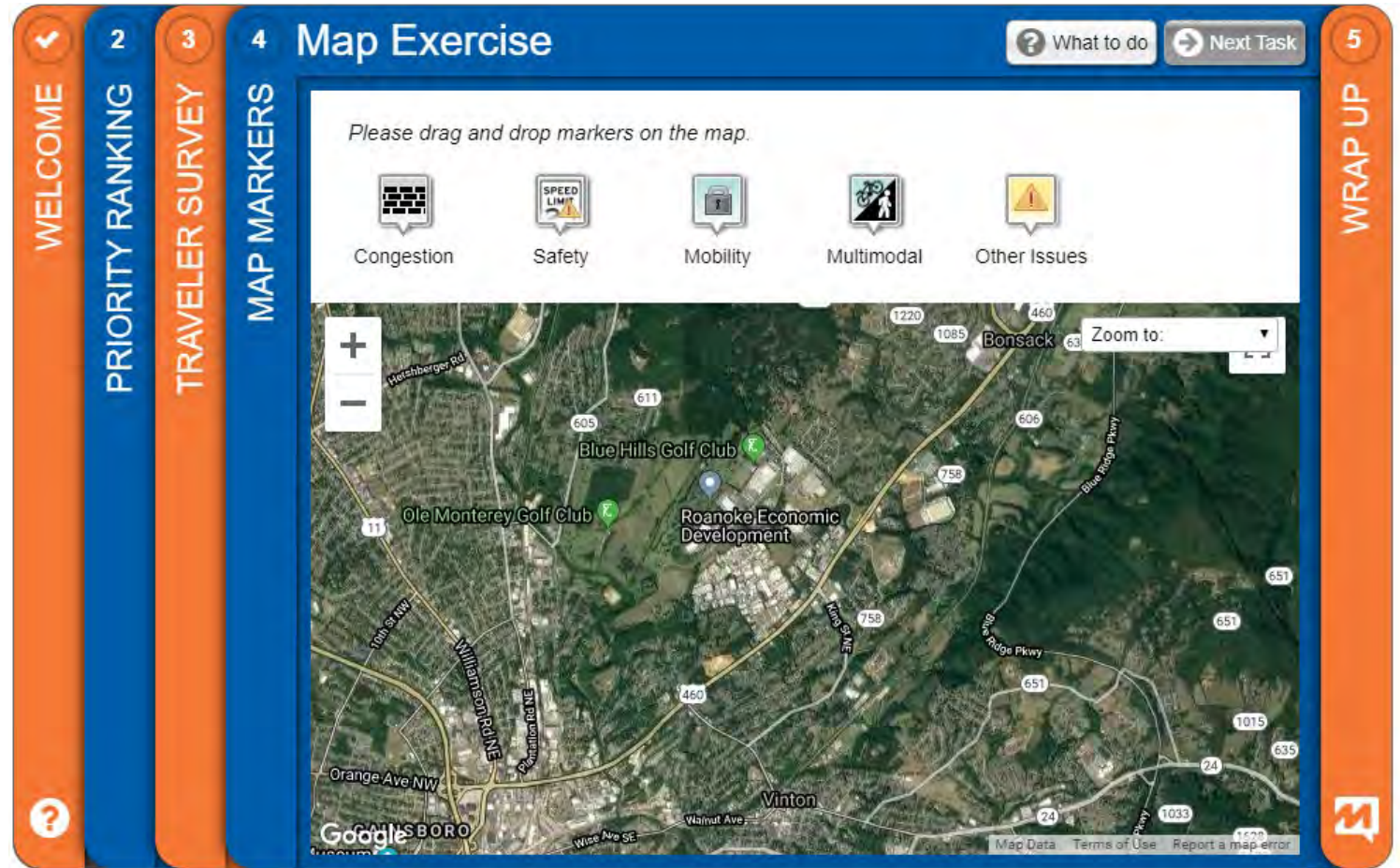


SURVEY SUMMARY – MAP EXERCISE

3,568*
Total Markers

1,229
Total Comments

-  **Congestion**
2,520 Markers
661 Comments
-  **Safety**
624 Markers
317 Comments
-  **Mobility**
188 Markers
70 Comments
-  **Multimodal**
105 Markers
70 Comments
-  **Other Issues**
131 Markers
111 Comments



* Includes 566 markers from unique Internet Protocol (IP) addresses; participants could place multiple markers per survey session.

SURVEY SUMMARY – MAP EXERCISE

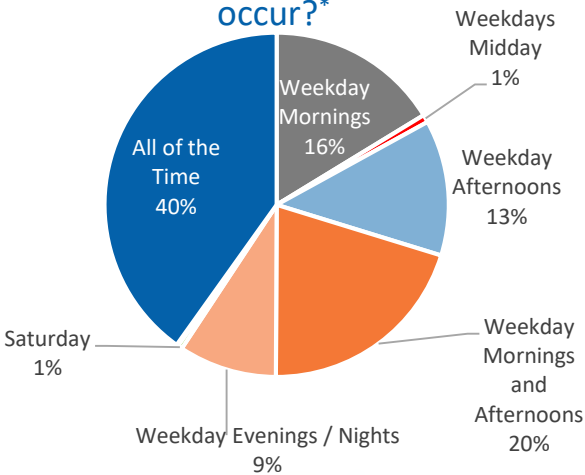


Congestion

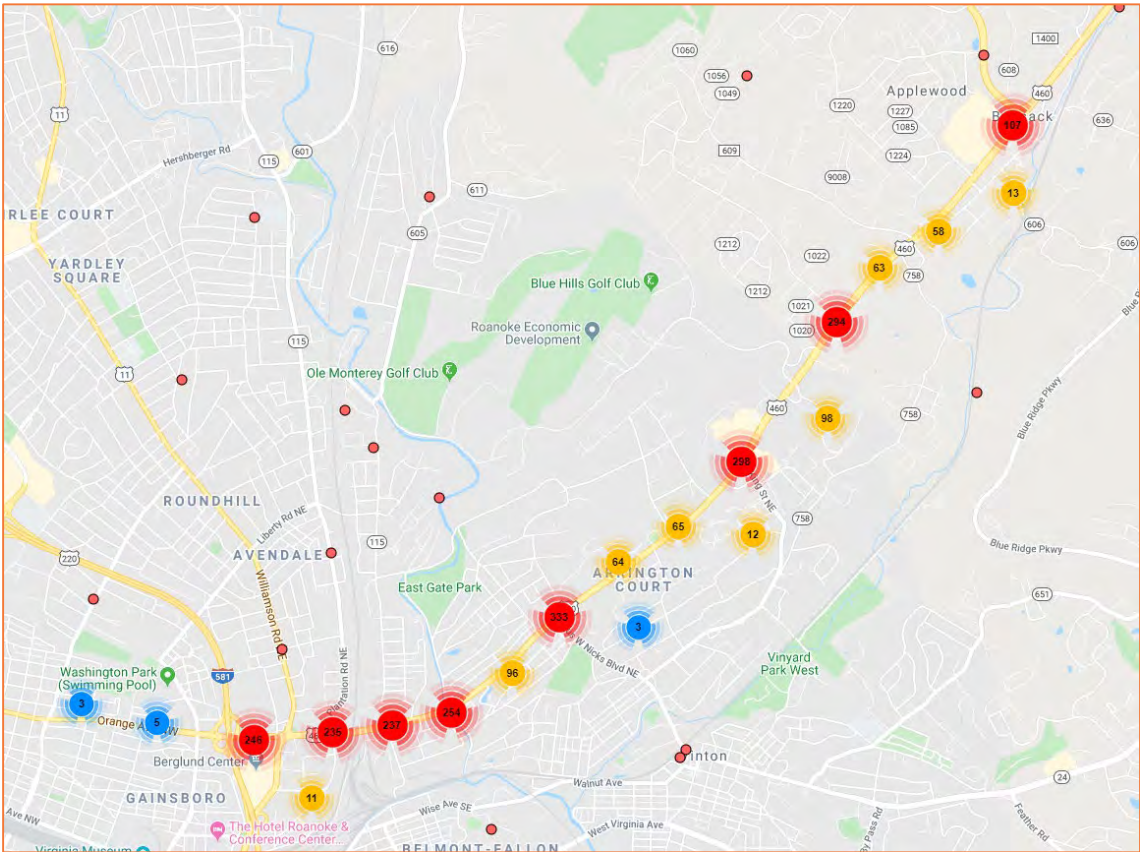
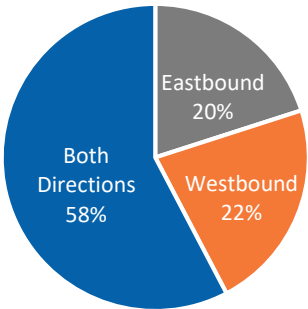
2,520 Markers
661 Comments

- Markers mapped indicate congestion occurs along the length of Route 460 in the study area
- Change in speed limits at W Ruritan Road and lane reduction at 11th Street suggested as reasons for congestion

When does congestion most often occur?*



In which direction does congestion most often occur?†



Larger circles denote higher concentration of markers and comments.

* 1132 congestion markers did not include response to question. † 1128 congestion markers did not include response to question.



SURVEY SUMMARY – MAP EXERCISE

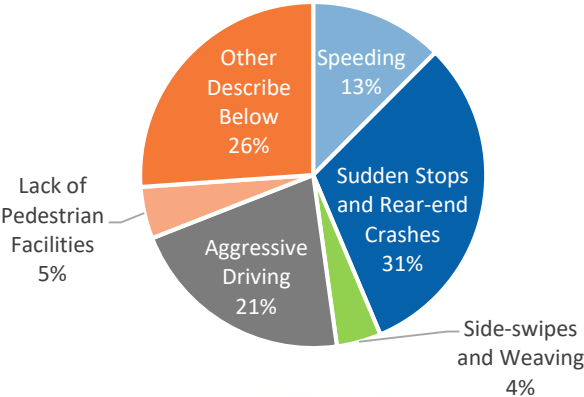


Safety

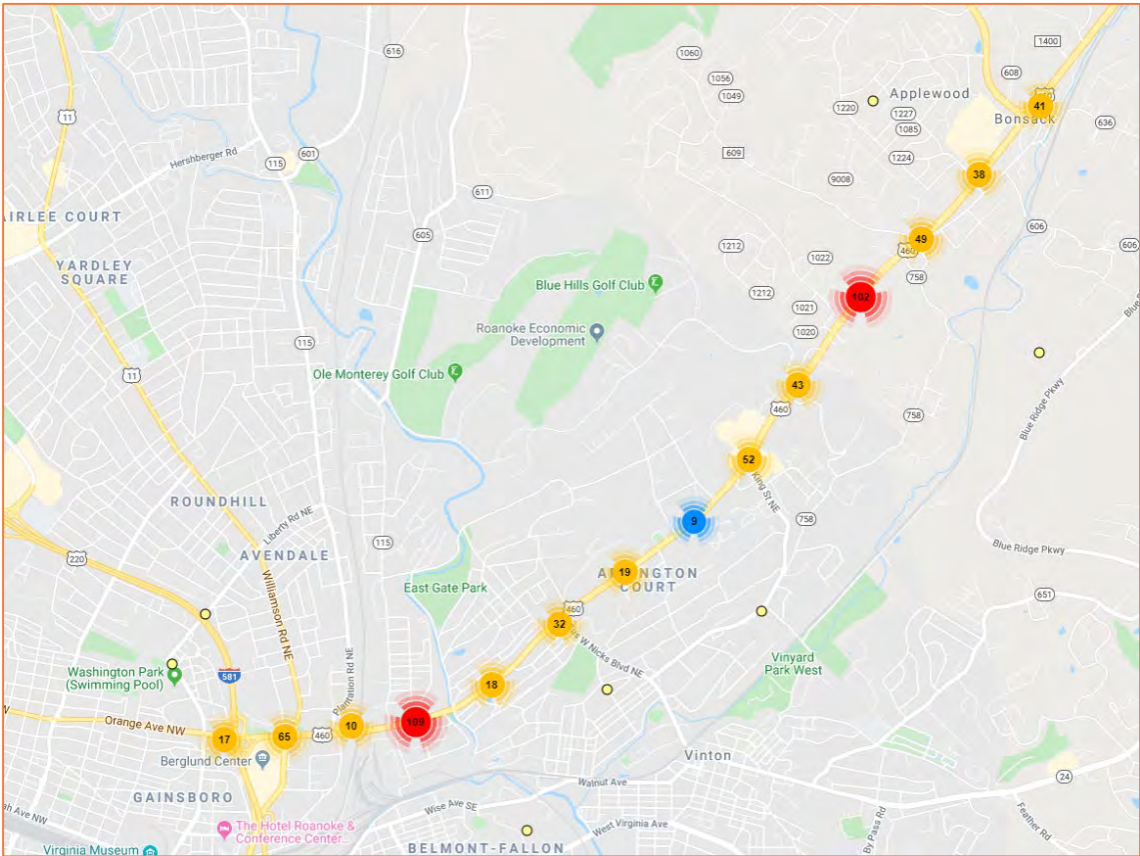
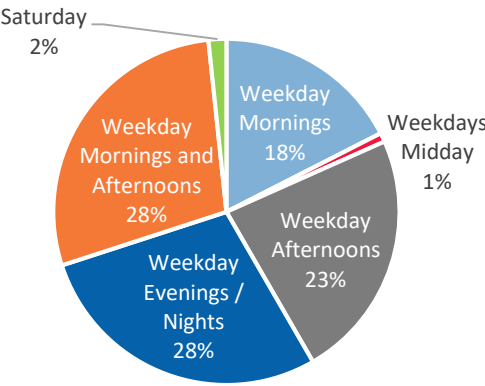
624 Markers
317 Comments

- Markers mapped indicate safety concerns at 11th Street (17%) and between E Ruritan Rd and W Ruritan Rd (17%)
- Left turns, median crossovers, and limited merge opportunities cited in majority of safety comments

What is the major safety concern?*



When does safety issue occur?†



Larger circles denote higher concentration of markers and comments.

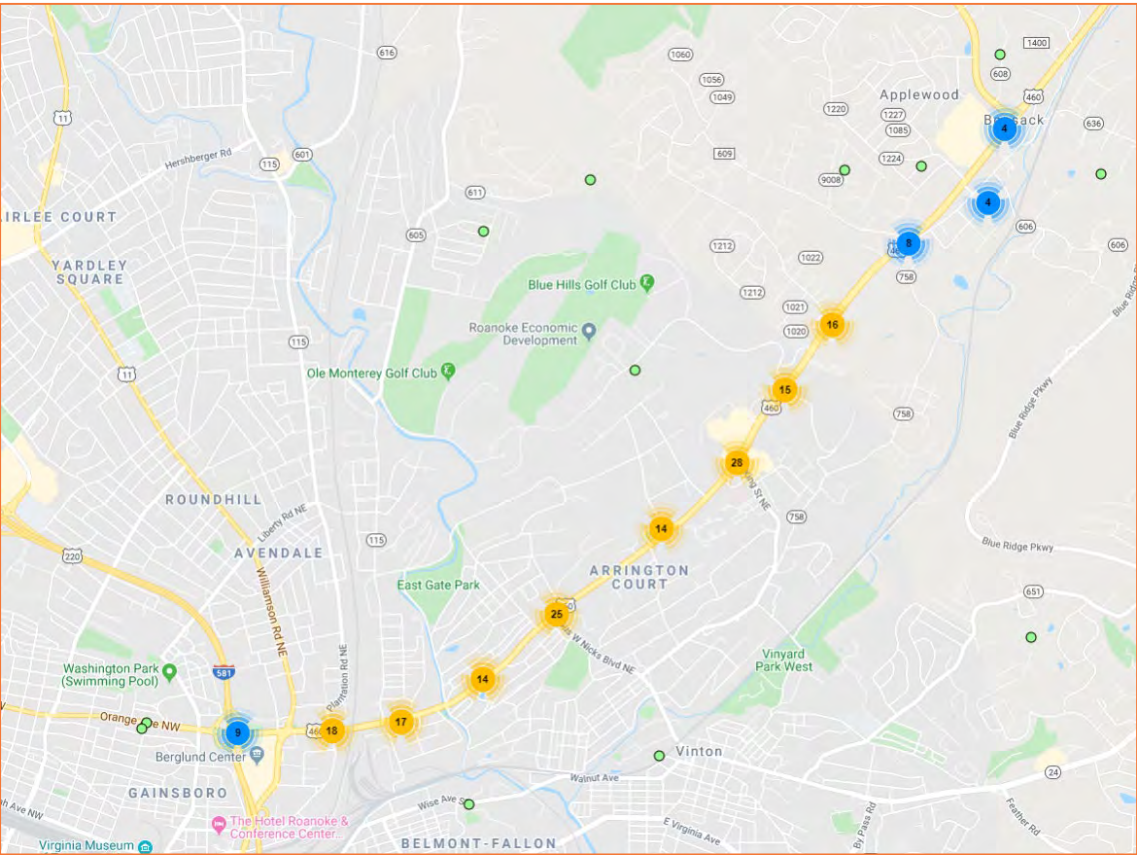
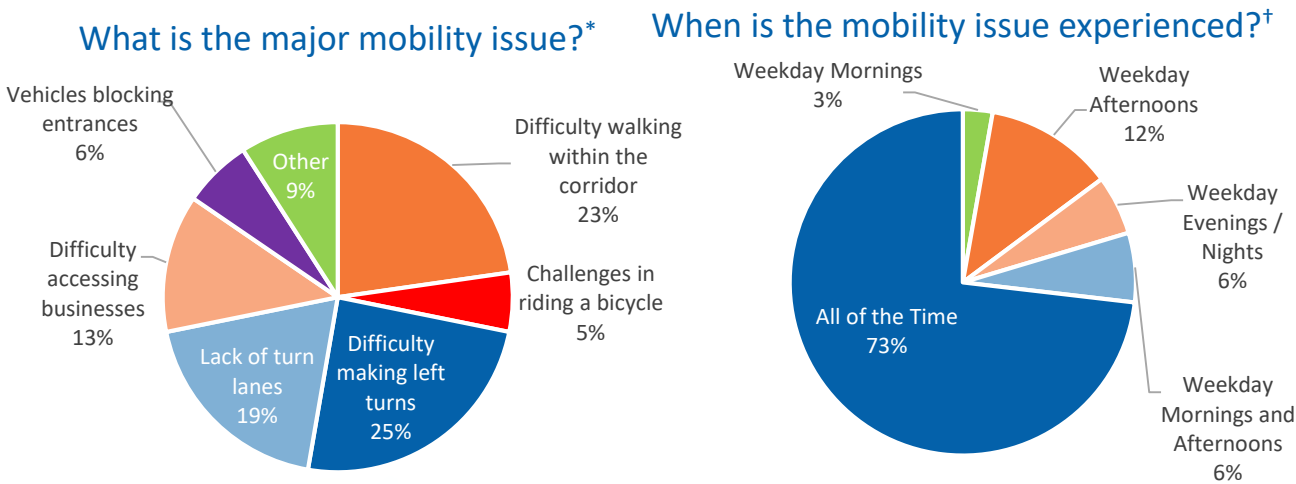
* 191 safety markers did not include response to question.

† 504 safety markers did not include response to question.

SURVEY SUMMARY – MAP EXERCISE

 **Mobility**
188 Markers
70 Comments


- Markers mapped indicate mobility issues identified along the length of Route 460 in the study area, concentrated at King Street (15%) and Gus W Nicks Boulevard (13%)
- Limited sidewalks, bike lanes, and left turn lanes noted in comments provided



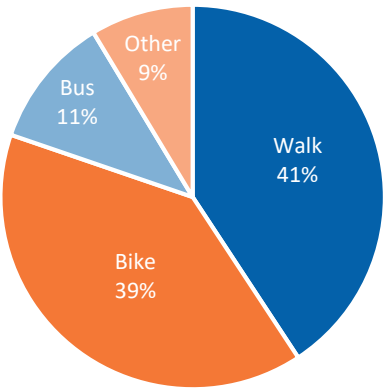
Larger circles denote higher concentration of markers and comments.

* 78 mobility markers did not include response to question. † 80 mobility markers did not include response to question.

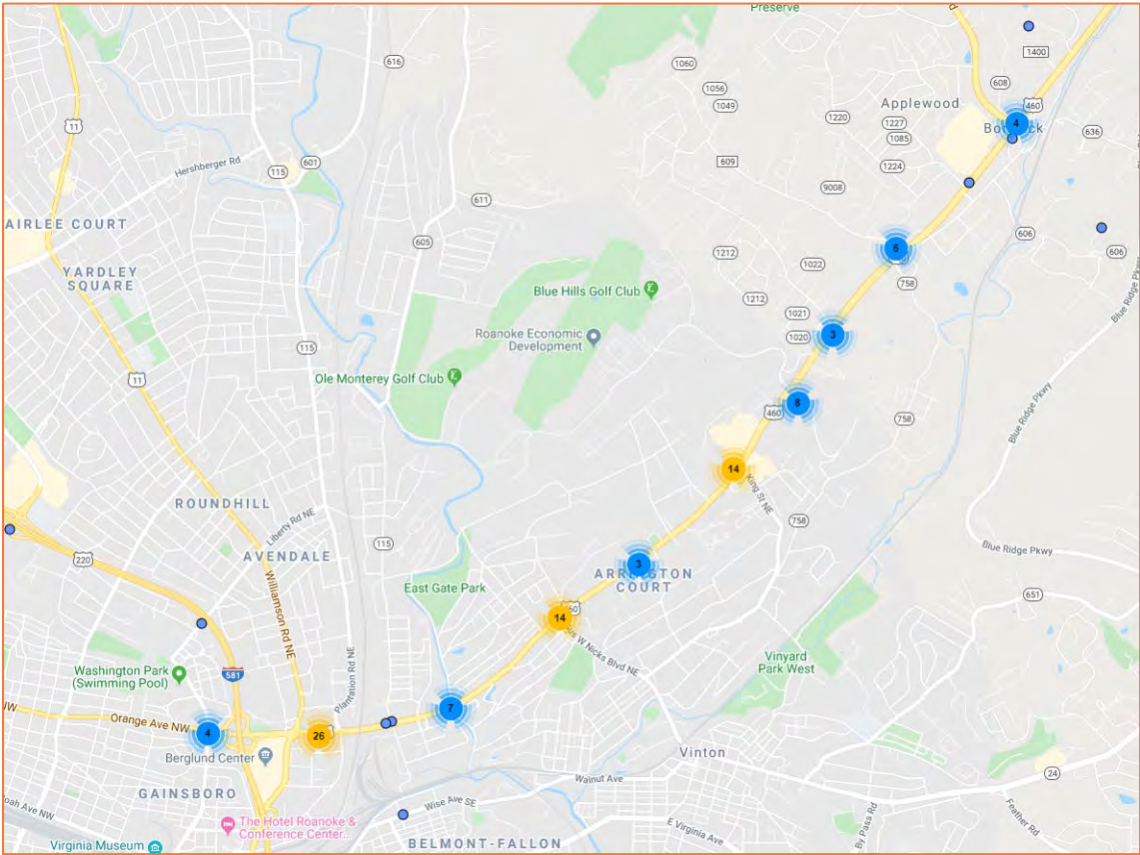
SURVEY SUMMARY – MAP EXERCISE

-  **Multimodal**
105 Markers
70 Comments
- Markers mapped indicate mobility considerations for Route 11/Williamson Road (25%), Gus W Nicks Boulevard (13%), and King Street (13%)
 - Limited sidewalks, bike lanes, and crosswalks noted in comments provided

Which travel mode to consider?*



* 24 multimodal markers did not include response to question.



Larger circles denote higher concentration of markers and comments.

SURVEY SUMMARY – MAP EXERCISE

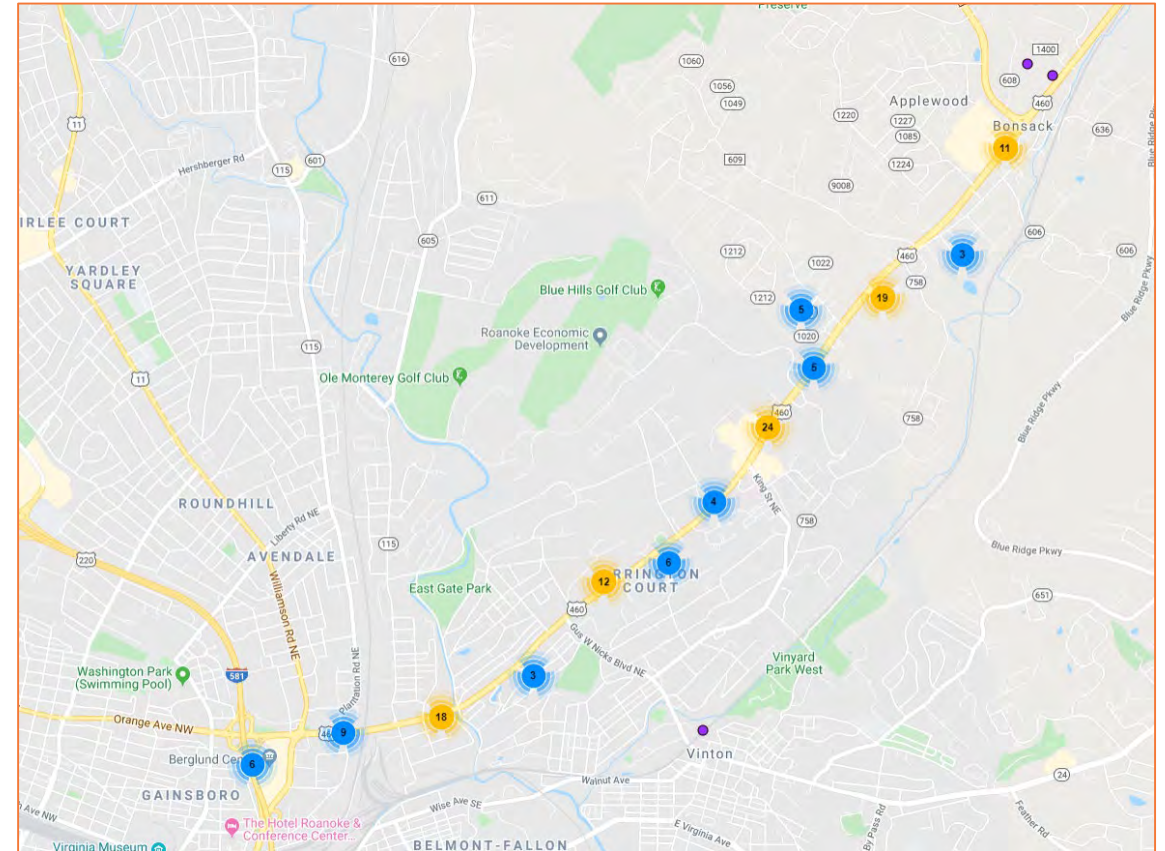


Other Issues

131 Markers

111 Comments

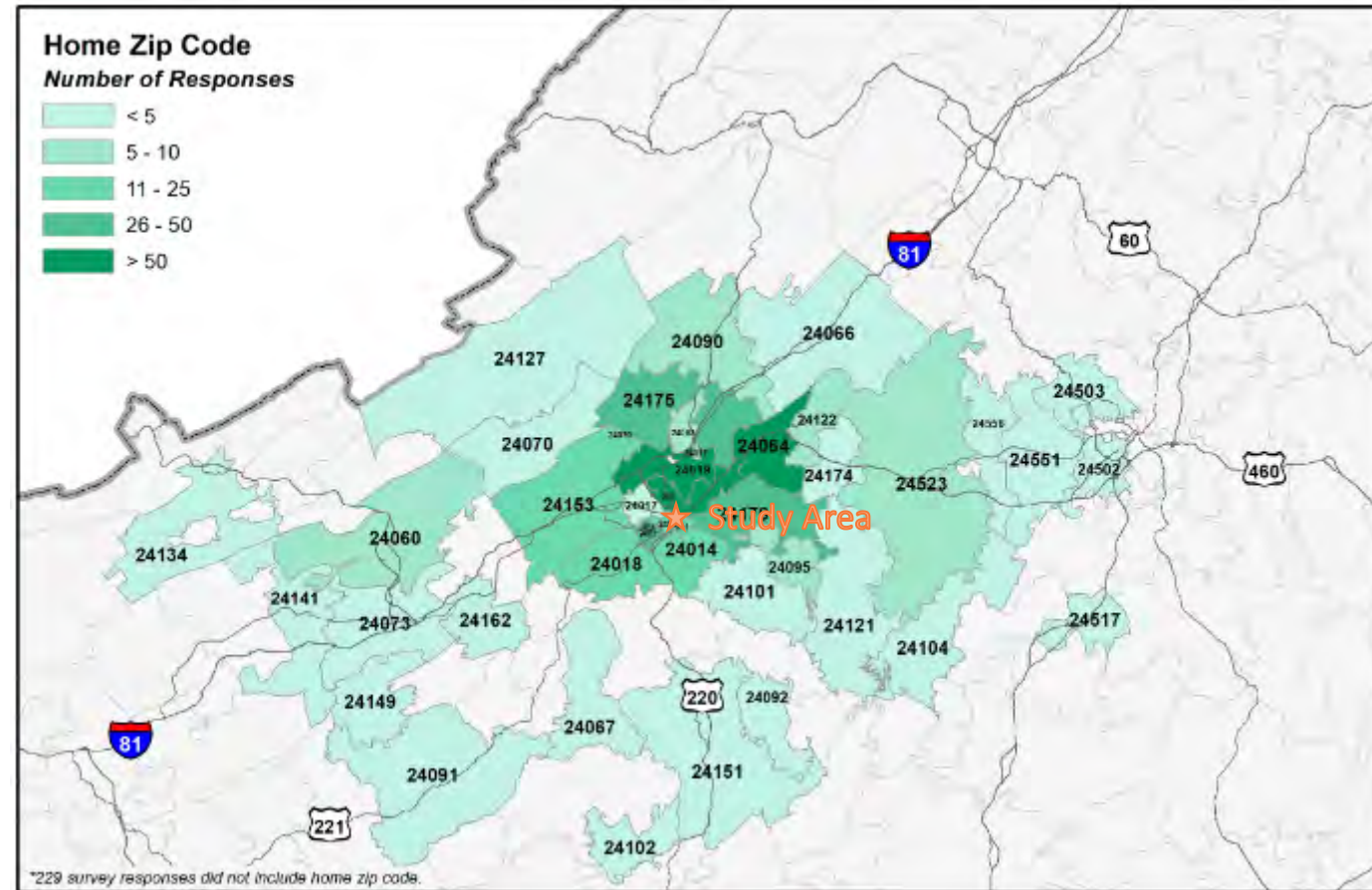
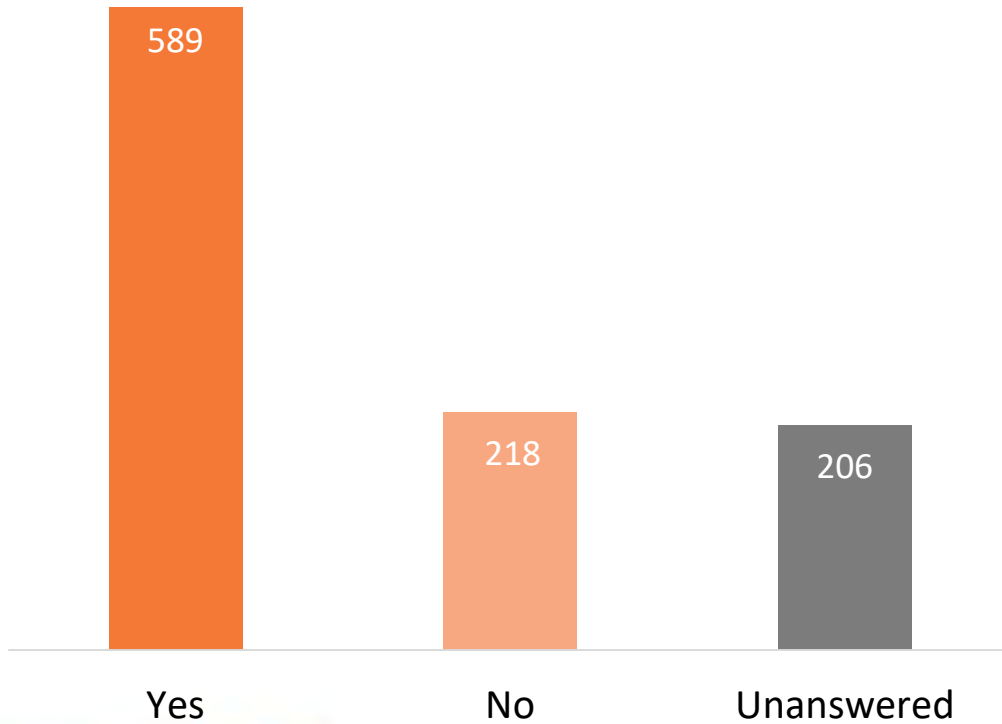
- Other issues identified include:
 - Traffic light synchronization
 - Truck traffic
 - Limited turning lane lengths
 - Visual intrusions (trees, signage)
 - Reiteration of other comments related to left turn difficulties



Larger circles denote higher concentration of markers and comments.

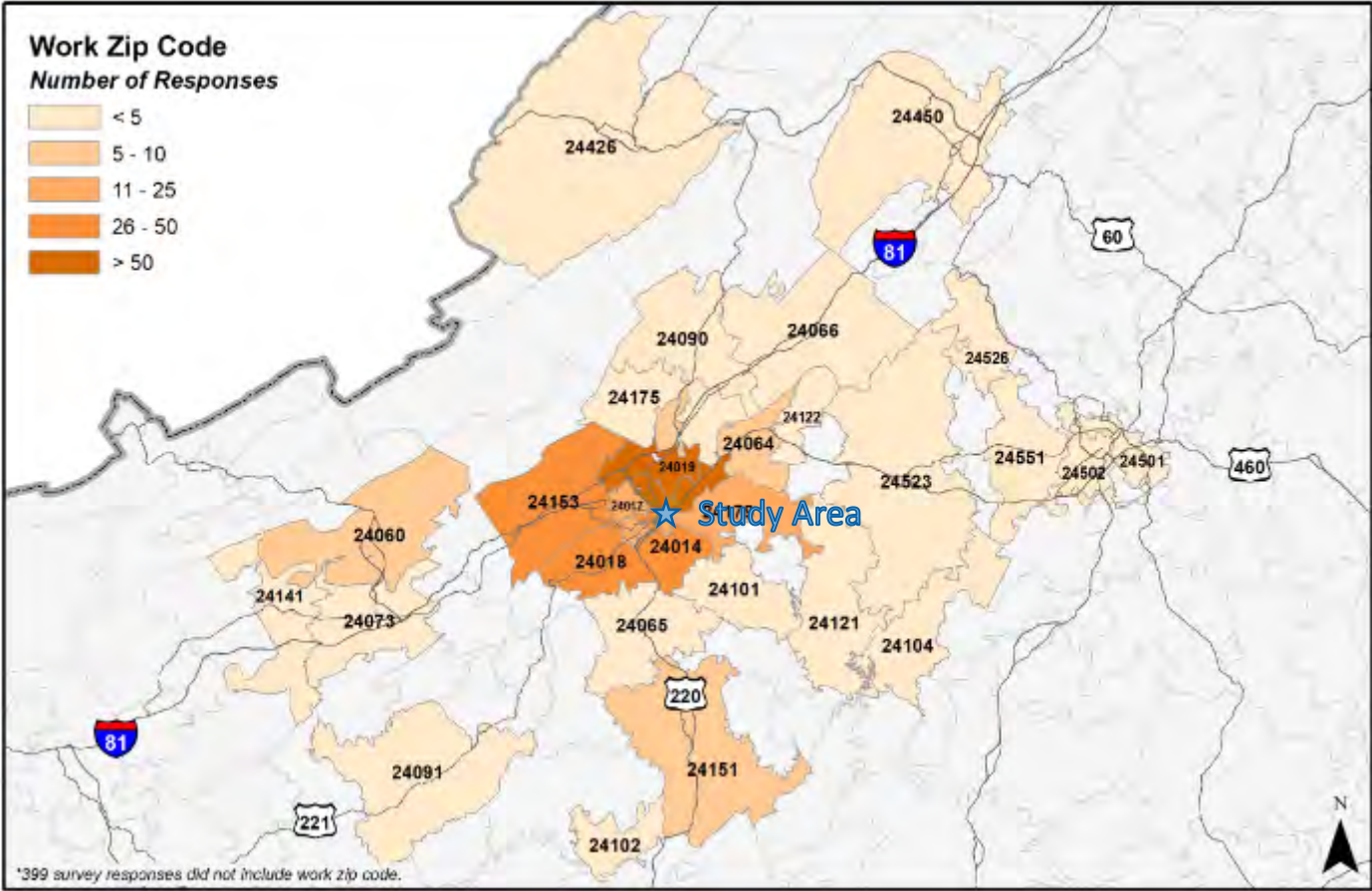
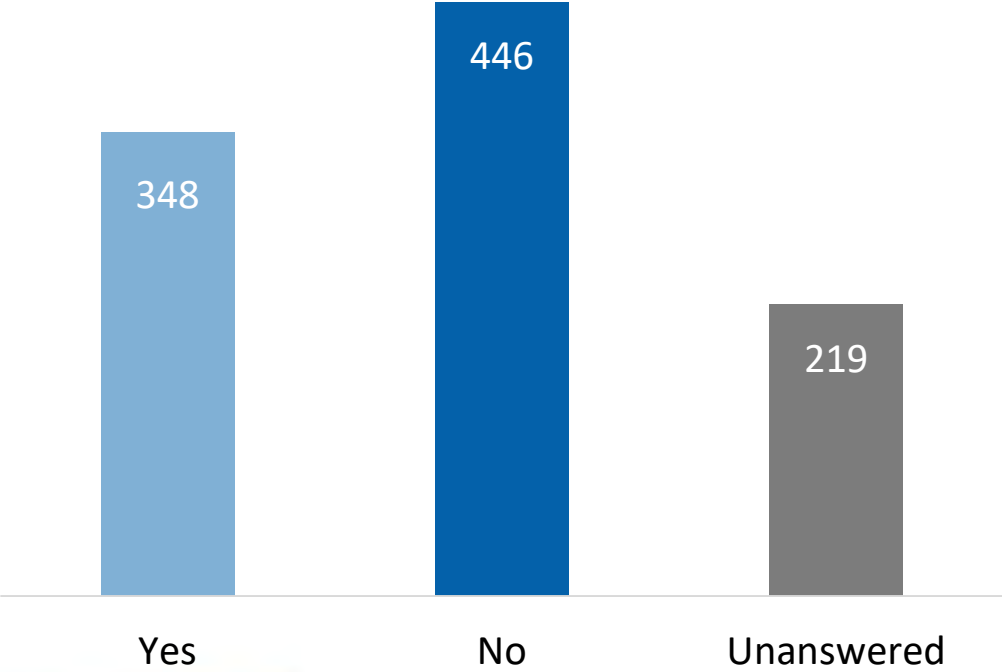
SURVEY SUMMARY – WRAP UP

Do you live along or near the corridor?

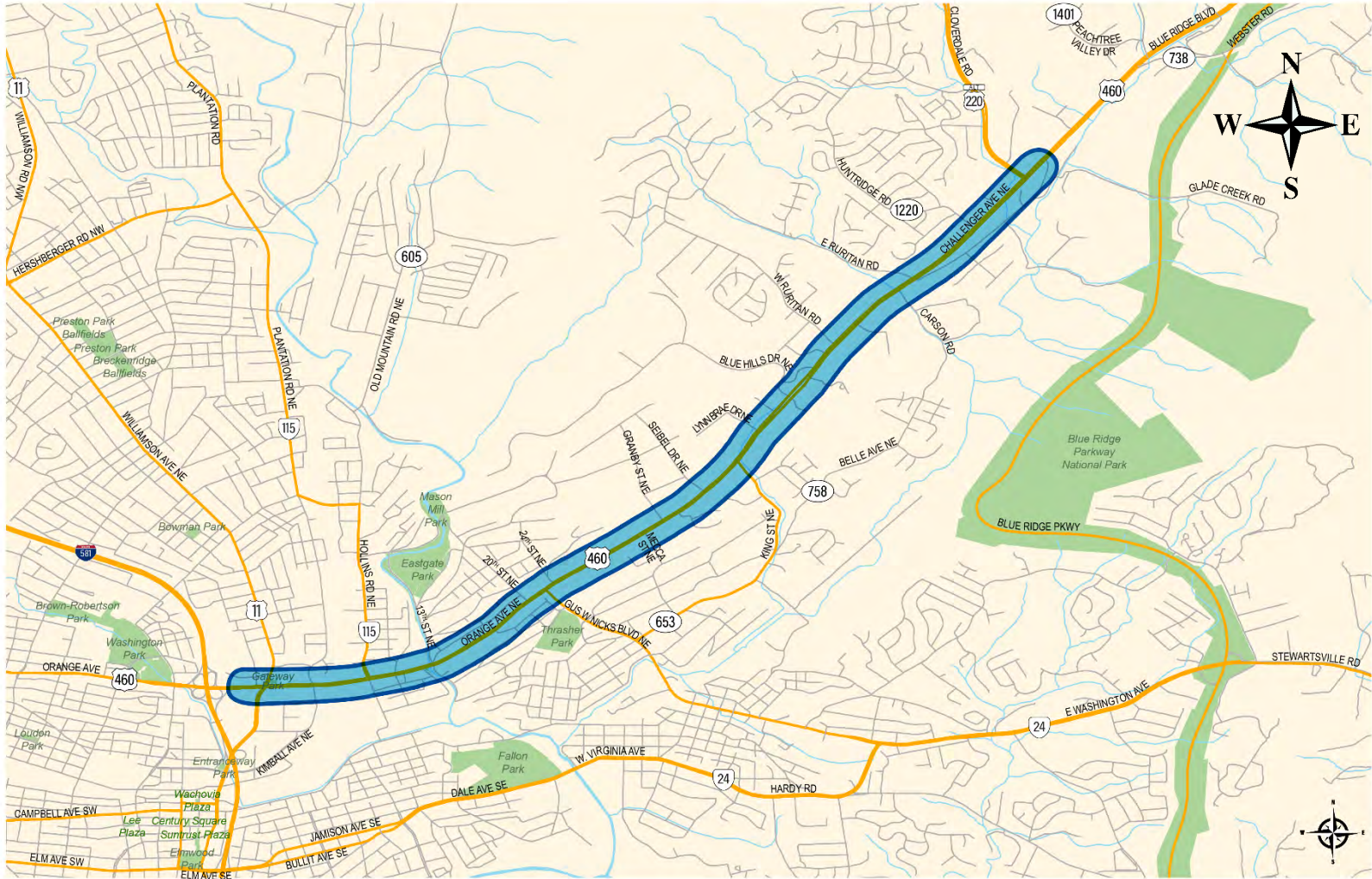


SURVEY SUMMARY – WRAP UP

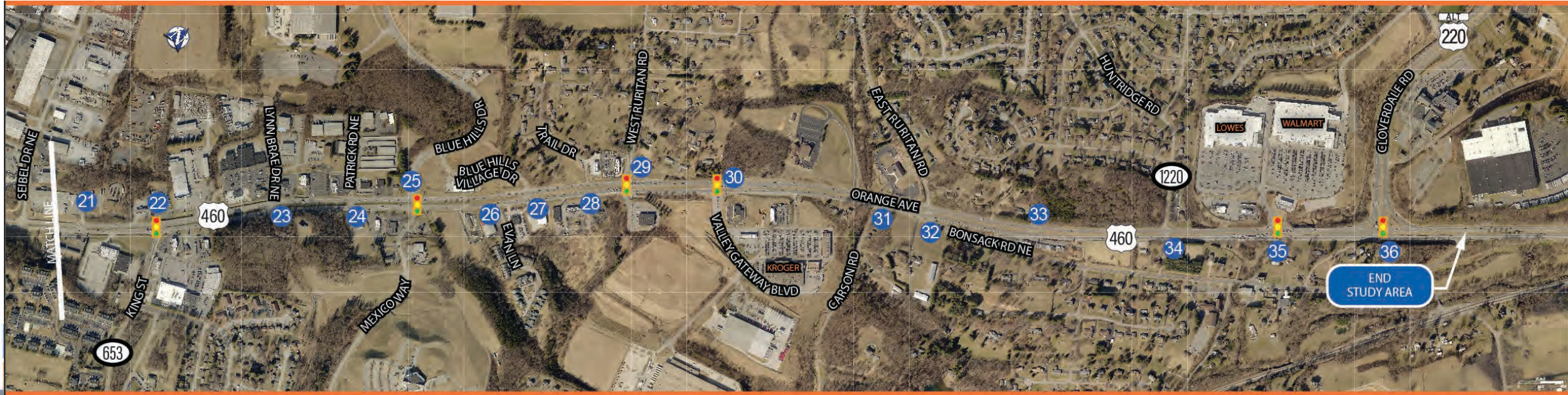
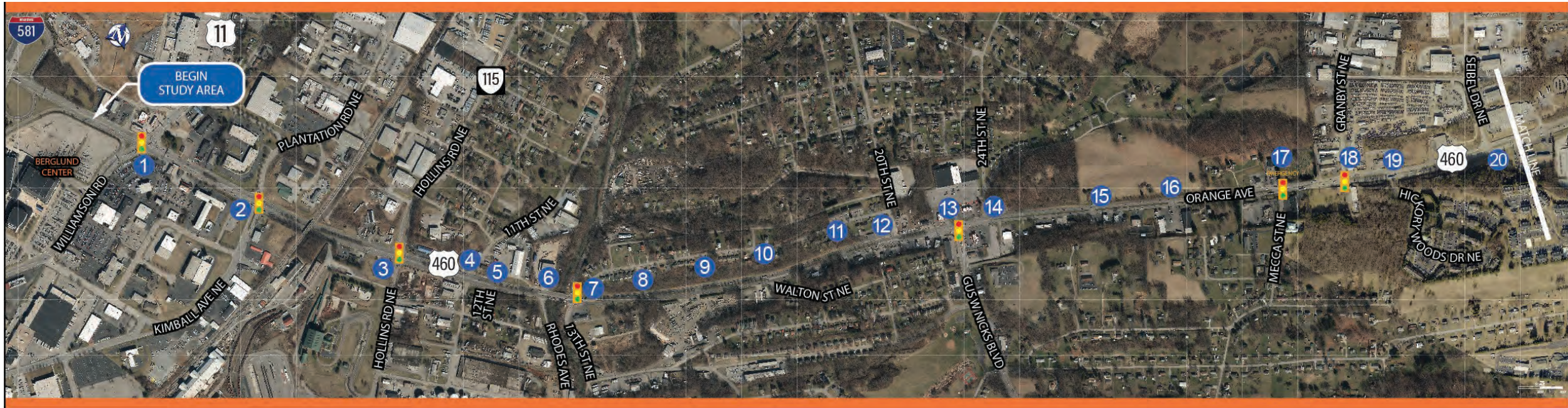
Do you work along or near the corridor?



STUDY AREA



Route 460 Operational Improvements Study



DEVELOPMENT OF NO BUILD TRAFFIC VOLUMES

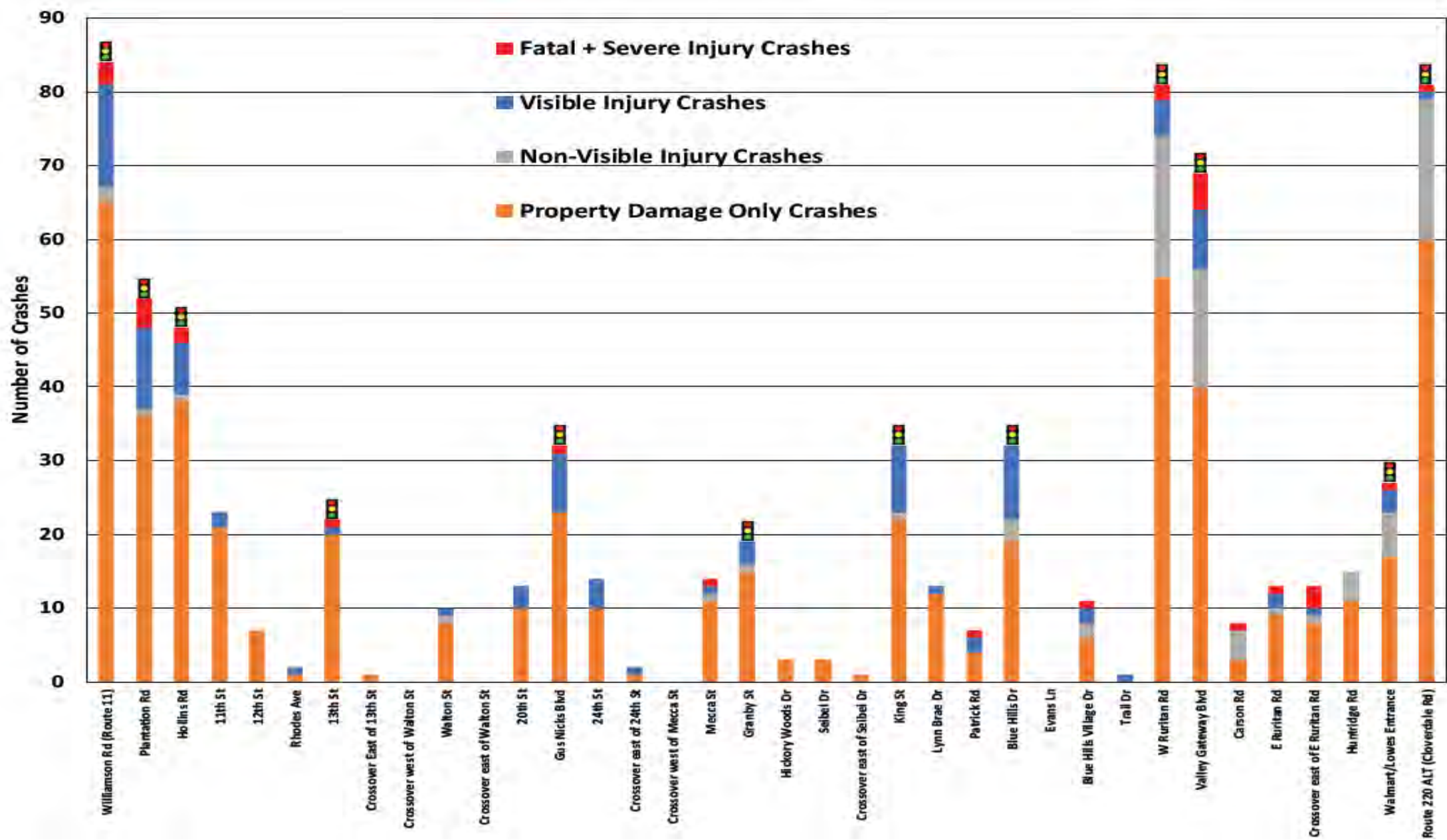
- Growth Rates**

Source: VDOT Statewide Planning System

Facility	From	To	Recommended Linear Growth Rate
Route 460	US Route 11 / Williamson Road	Route 115 / Plantation Road	0.5%
Route 460	Route 115 / Plantation Road	24 th Street	0.5%
Route 460	24 th Street	King Street	0.5%
Route 460	King Street	Roanoke City/Roanoke County Line	0.5%
Route 460	Roanoke City/Roanoke County Line	Route 220 Alt / Cloverdale Road	0.5%
Route 11 / Williamson Road	I-581 Ramp	Liberty Road	0.5%
Kimball Avenue	US Route 11 – Williamson Road	Route 460	0.611%
Route 115 / Hollins Road	Norfolk Avenue	Liberty Road	0.5%
Gus Nicks Boulevard	Roanoke City/Town of Vinton Line	Route 460	0.5%
King Street	Gus Nicks Boulevard	Route 460	0.635%
Carson Road	Roanoke City/Roanoke County Line	Route 460	1.1%
Route 220 Alt / Cloverdale Road	Route 460	Roanoke County/Botetourt County Line	1.168%

- Added site trips from TIAs**

- District Vue Apartments - 324-unit apartment complex east of 24th Street
- Richfield Living complex on Mecca Street
- LewisGale ER Facility on West Ruritan Road



1 ROUTE 460 AT WILLIAMSON ROAD – TRAFFIC OPERATIONS

2040 Traffic Volumes

AM Peak				PM Peak			
233	227	97	161	357	348	225	141
↶	↷	↶	↷	↶	↷	↶	↷
1677	143	160	208	1478	98	223	307
↶	↷	↶	↷	↶	↷	↶	↷
370	1125	294	46	328	1349	133	80
↶	↷	↶	↷	↶	↷	↶	↷

2040 No Build Traffic Operations

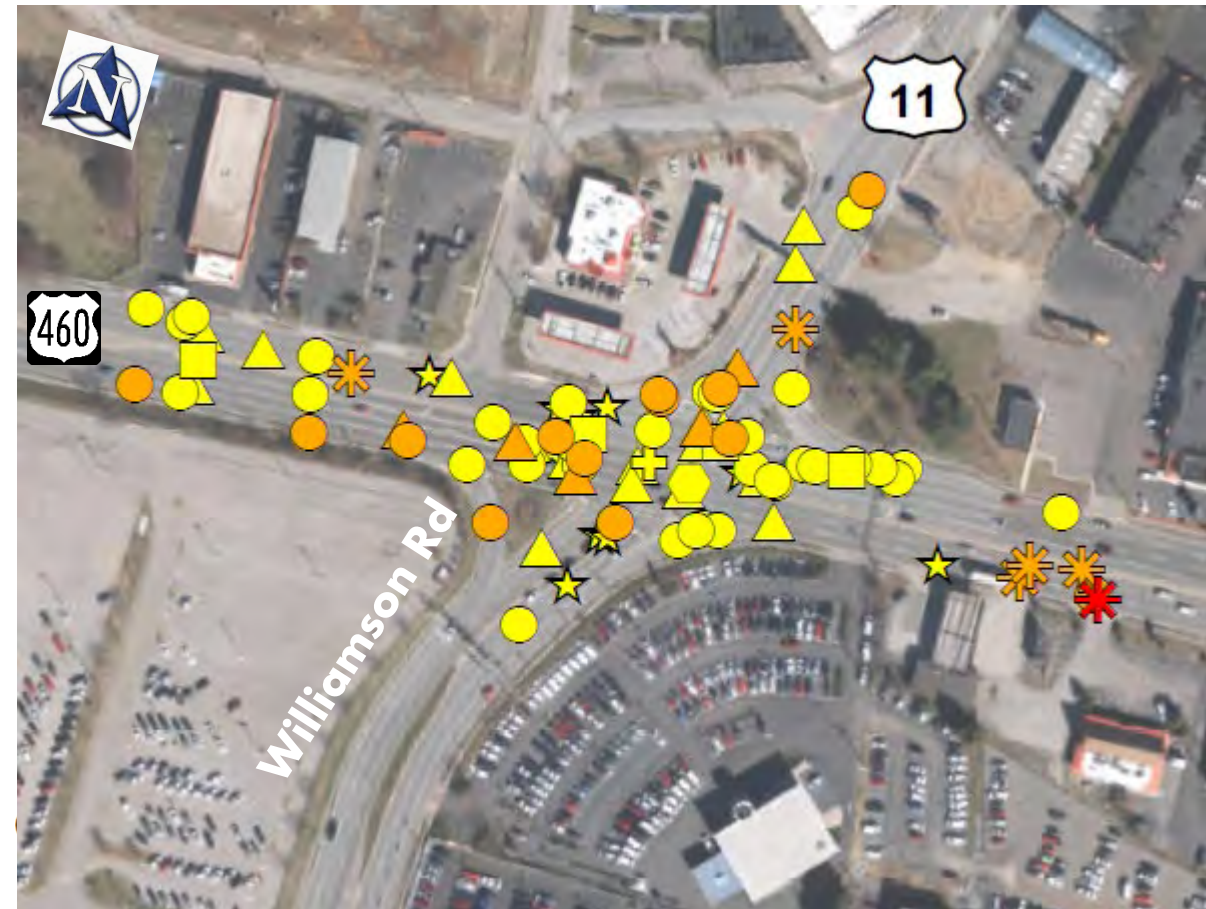
Peak Hour	INT		EBT	WBT	EBL	WBL	NB	SB
	LOS	Delay	Movement/Approach Delay (sec)					
AM	F	88	52	91	183	30	90	140
PM	F	121	44	96	160	49	79	265



1 ROUTE 460 AT ROUTE 11/WILLIAMSON ROAD – SAFETY CONDITIONS

■ 84 crashes

- 45 (54%) rear end crashes
 - 17 EB crashes
 - 17 WB crashes
- 22 (26%) angle crashes
- 9 sideswipe crashes
- 7 pedestrian crashes in the vicinity of intersection
 - 2 fatalities
 - 5 injuries
 - 2 occurred at nighttime
 - 2 occurred during twilight



△	Angle	◇	Deer/Other Animal	■	INJURY
✱	Pedestrian	⊕	Other	●	PROPERTY DAMAGE ONLY
○	Head On				

① ROUTE 460 AT ROUTE 11/WILLIAMSON ROAD – ALTERNATIVES CONSIDERED

- EB double left-turn lane
- SB right-turn lane
- EB right-turn lane (**NOT RECOMMENDED**)
- **Recommend more detailed study of improvements in conjunction with I-581 interchange**
 - Address weave from NB I-581 to NB Route 11

Option	LOS		Delay (sec)		Notable Delay Improvements (sec)
	AM	PM	AM	PM	
No Build	F	F	88	121	--
EB Double Left	E	F	59	95	AM: EBL: -109, WBT: -60 PM: EBL: -80, WBT: -73
SB Right	E	F	78	87	AM: SBT: -68, NBL: -51 PM: SBT: -238
EB Right	F	F	85	121	AM: EBT: -9 PM: EBT: -2, WBT: -2
Combined (Double EBL and SBR)	D	E	48	61	AM: EBL: -109, WBT: -65, SBT: -68, NBL: -51 PM: EBL: -80, WBT: -77, SBT: -238

① ROUTE 460 AT ROUTE 11/WILLIAMSON ROAD – POTENTIAL IMPROVEMENTS



2 ROUTE 460 AT PLANTATION ROAD / KIMBALL AVENUE – TRAFFIC OPERATIONS

2040 Traffic Volumes

AM Peak				PM Peak			
127	236	62	139	146	85	141	73
125	1124	29	1844	123	1521	20	1538
20	78	201	344	28	214	526	132

2040 No Build Traffic Operations

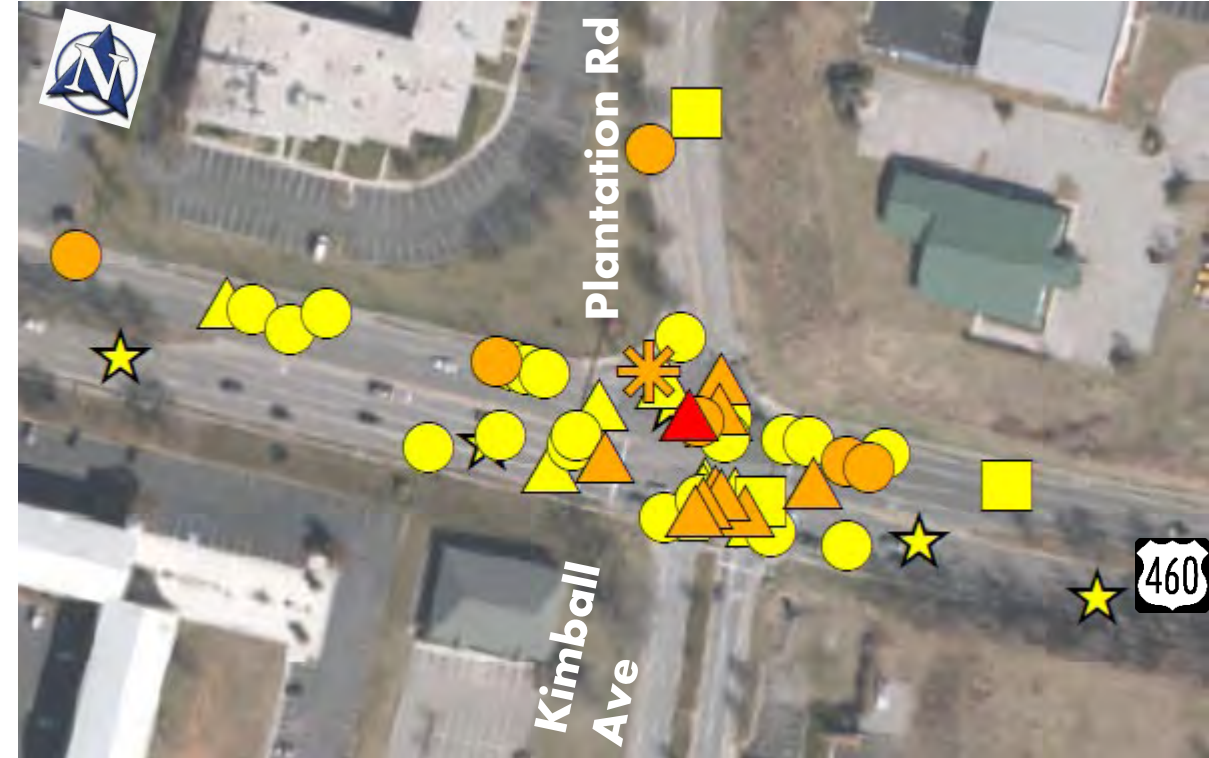
Peak Hour	INT		EBT	WBT	EBL	WBL	NB	SB
	LOS	Delay	Movement/Approach Delay (sec)					
AM	E	78	12	95	88	211	73	73
PM	E	76	35	50	88	87	178	89














2 ROUTE 460 AT PLANTATION ROAD / KIMBALL AVENUE – SAFETY CONDITIONS

- 52 crashes

- 22 (42%) rear end crashes
 - 8 EB crashes
 - 12 WB crashes
- 21 (40%) angle crashes
 - 10 left-turn angle crashes
 - 6 WBL / EBT
 - 4 EBL / WBT
- 1 pedestrian crash (injury)
- 1 bicycle crash (injury)



Crash Type		Crash Severity	
	Rear End		Sideswipe
	Angle		Fixed Object
	Pedestrian		Deer/Other Animal
	Head On		Other
			FATAL
			INJURY
			PROPERTY DAMAGE ONLY

② ROUTE 460 AT PLANTATION ROAD / KIMBALL AVENUE – ALTERNATIVES CONSIDERED

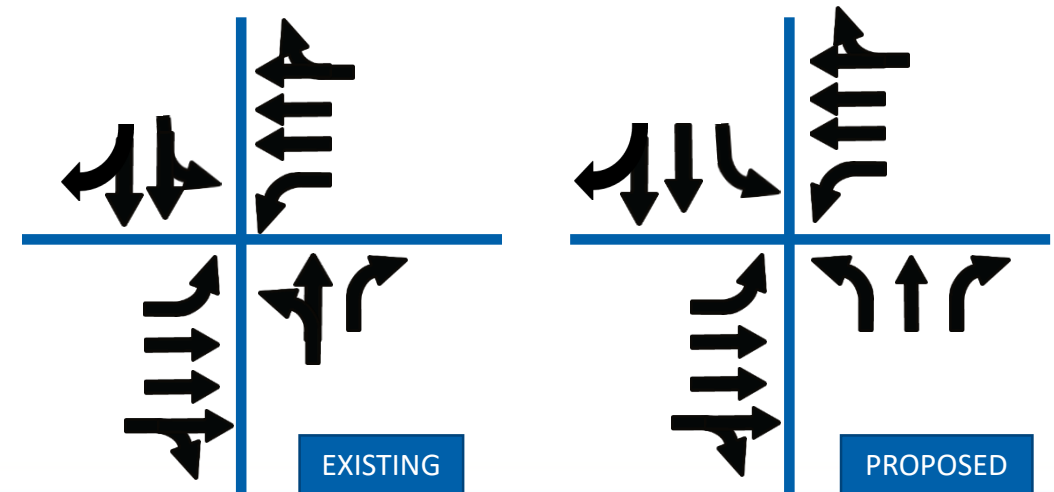
■ Double WB left-turn lane (NOT RECOMMENDED)

- Requires shifting WB Route 460 thru lanes beyond RR bridge

■ Widen NB and SB approaches to 3 lanes (RECOMMENDED)

- Split phasing; or
- Protected-only left-turn phasing

Option	LOS		Delay (sec)		Notable Delay Improvements (sec)
	AM	PM	AM	PM	
No Build	E	E	78	76	--
Double WBL	E	E	64	75	AM: WBL: -176 PM: WBL: -22
Widen NB and SB (split phasing)	D	E	48	63	AM: WBL: -75, EBT: -5 PM: NBT: -22, SBT: -19, EBT: -9, WBT: -24
Widen NB and SB (protected-only phasing)	D	E	36	56	AM: NBT: -39, WBL: -104, WBT: -69 PM: NBT: -40, SBT: -37, WBT: -26



② ROUTE 460 AT PLANTATION ROAD / KIMBALL AVENUE – POTENTIAL IMPROVEMENTS



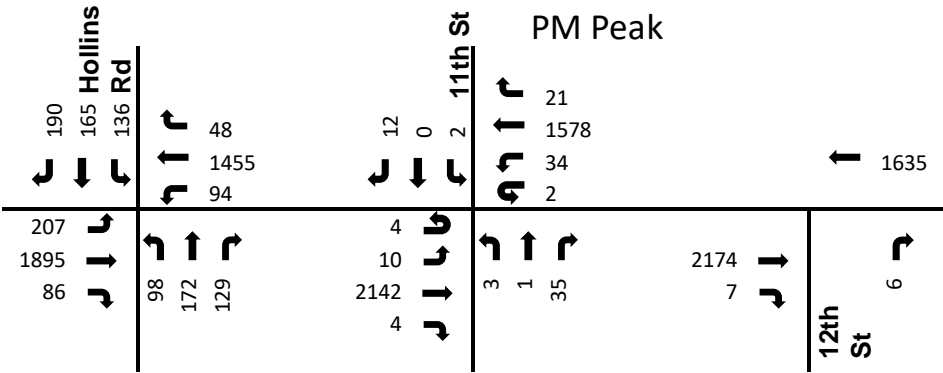
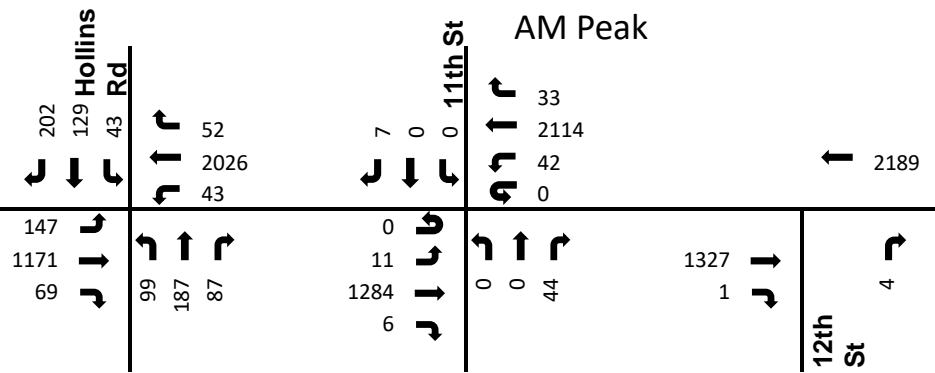
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4

5

ROUTE 460 AT HOLLINS ROAD, 11TH STREET AND 12TH STREET – TRAFFIC OPERATIONS

2040 Traffic Volumes



2040 No Build Traffic Operations (including SMART SCALE improvements)

Peak Hour	Route 460 at Hollins Rd							
	INT		EBT	WBT	EBL	WBL	NB	SB
	LOS	Delay	Movement/Approach Delay (sec)					
AM	E	69	19	103	74	12	82	37
PM	E	70	47	70	49	63	142	51



ROUTE 460 AT HOLLINS ROAD, 11TH STREET AND 12TH STREET – SAFETY CONDITIONS

3 Hollins Road - 48 crashes

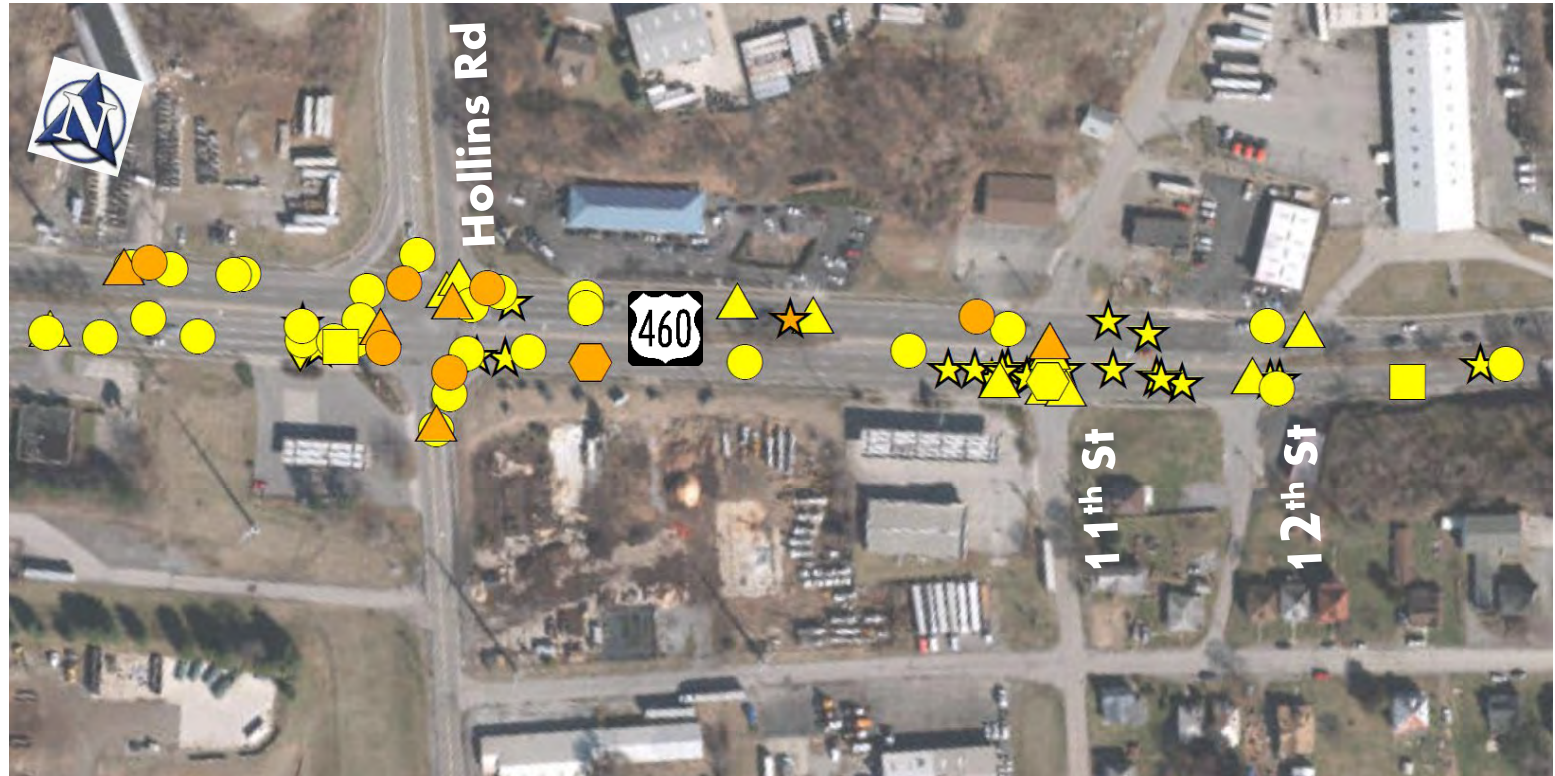
- 30 (63%) rear end crashes
 - 15 EB crashes
 - 11 WB crashes
- 9 angle crashes
- 7 sideswipe crashes

4 11th Street - 23 crashes

- 12 sideswipe crashes (many due to EB lane reduction)
- 6 angle crashes
 - 1 SBL / WBT
 - 3 WBL / EBT
 - 1 SBT / EBT
- 4 rear end crashes

5 12th Street – 7 crashes

- 5 sideswipe crashes
- 1 angle crash
- 1 rear end crash



Crash Type

- Rear End
- △ Angle
- ✱ Pedestrian
- ◇ Head On

Crash Type

- ☆ Sideswipe
- Fixed Object
- ◇ Deer/Other Animal
- ✱ Other

Crash Severity

- FATAL
- INJURY
- PROPERTY DAMAGE ONLY

ROUTE 460 AT HOLLINS ROAD, 11TH STREET AND 12TH STREET – ALTERNATIVES CONSIDERED

3 Hollins Road

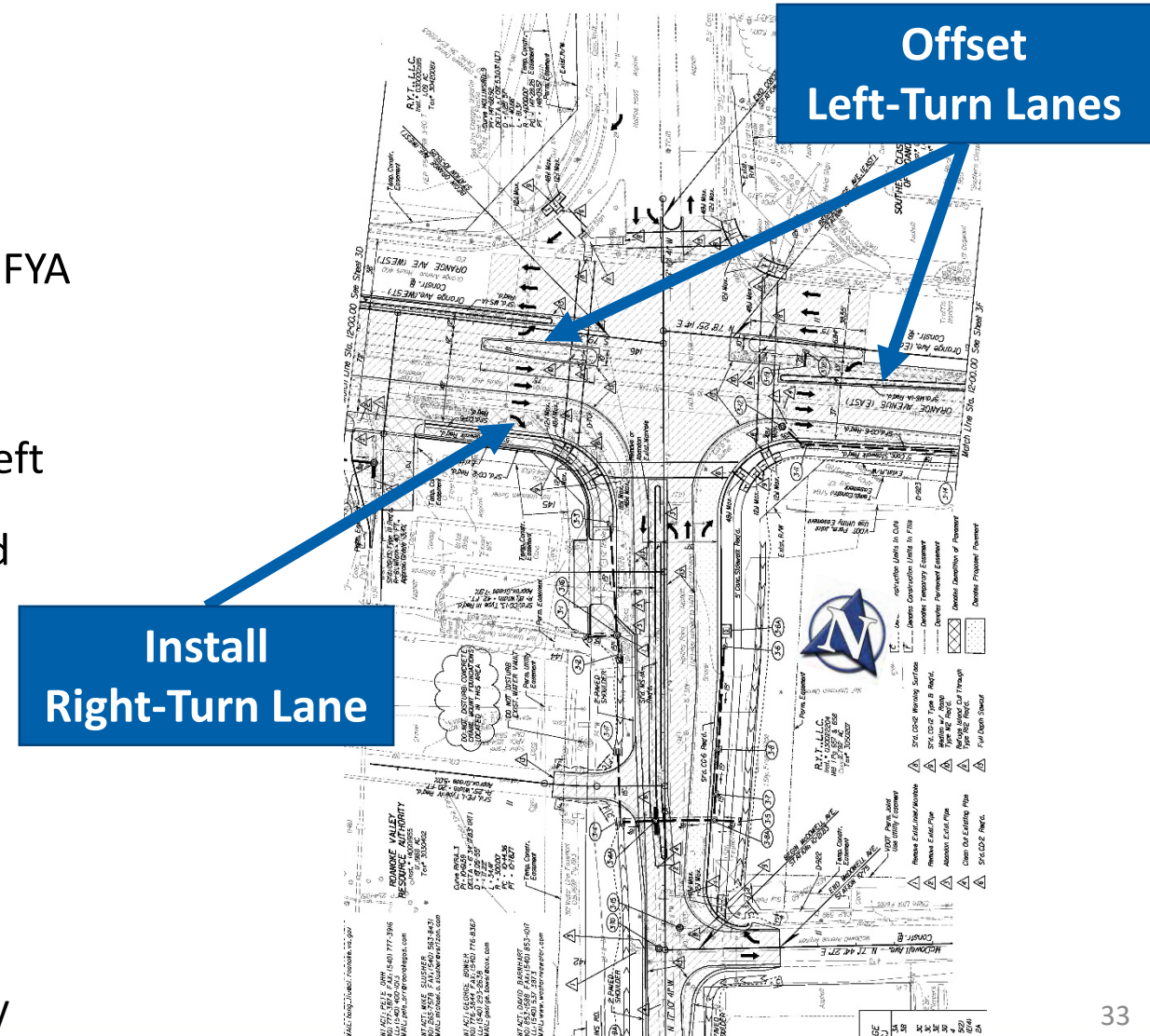
- No Build Improvements (SMART SCALE)
 - Install EB right-turn lane
 - Offset EB and WB left-turn lanes
 - Protected-permissive left-turn phasing with FYA

4 11th Street

- RCUT (RECOMMENDED)
 - Minimal NB left turn/thru (≤ 4 vph) and SB left turn/thru (≤ 2 vph) during peak periods
 - NB and SB left turns diverted to Hollins Road
- Accommodate WB left-turn only
- Accommodate EB left-turn only
- Close median

5 12th Street

- No improvements

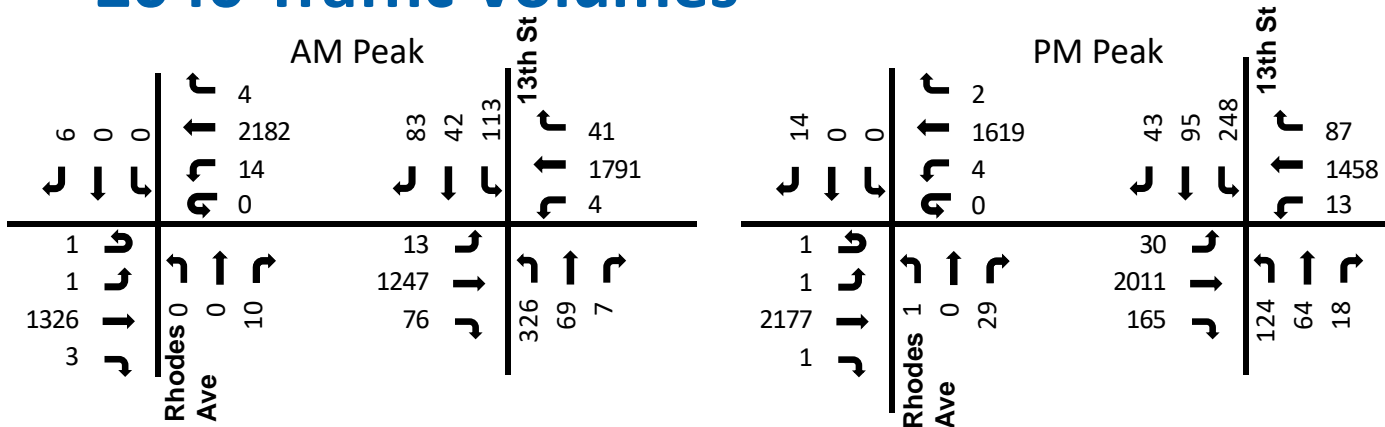


4 ROUTE 460 AT 11TH STREET — POTENTIAL IMPROVEMENTS



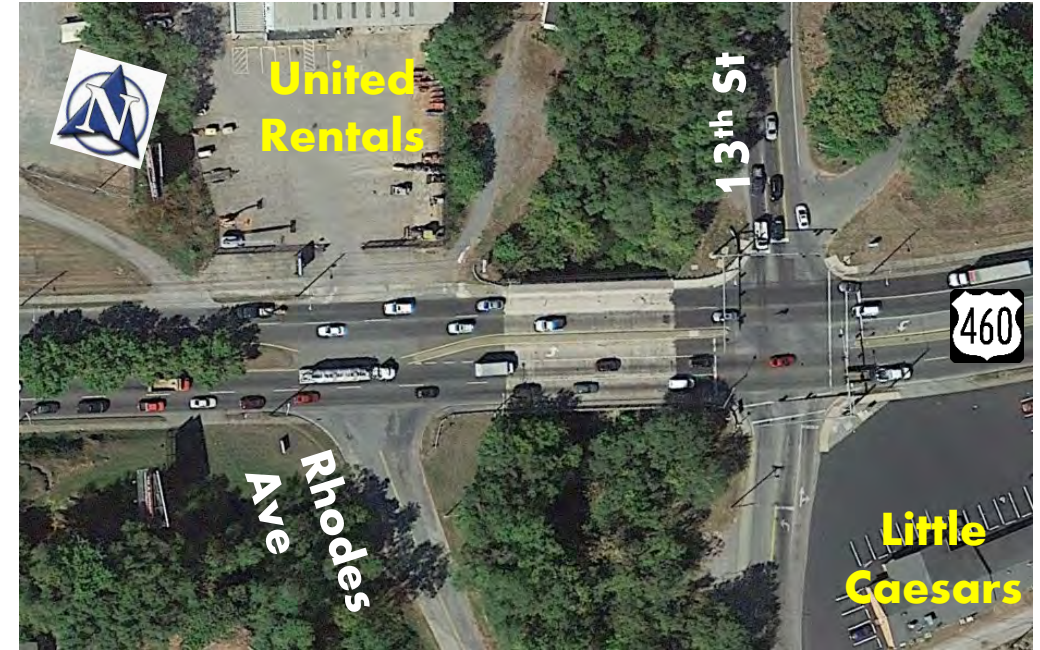
6 7 ROUTE 460 AT RHODES AVENUE AND 13TH STREET – TRAFFIC OPERATIONS

2040 Traffic Volumes



2040 No Build Traffic Operations

Peak Hour	Route 460 at 13 th Street							
	INT		EBT	WBT	EBL	WBL	NB	SB
	LOS	Delay	Movement/Approach Delay (sec)					
AM	F	98	61	118	128	26	110	124
PM	E	68	75	31	64	41	98	144



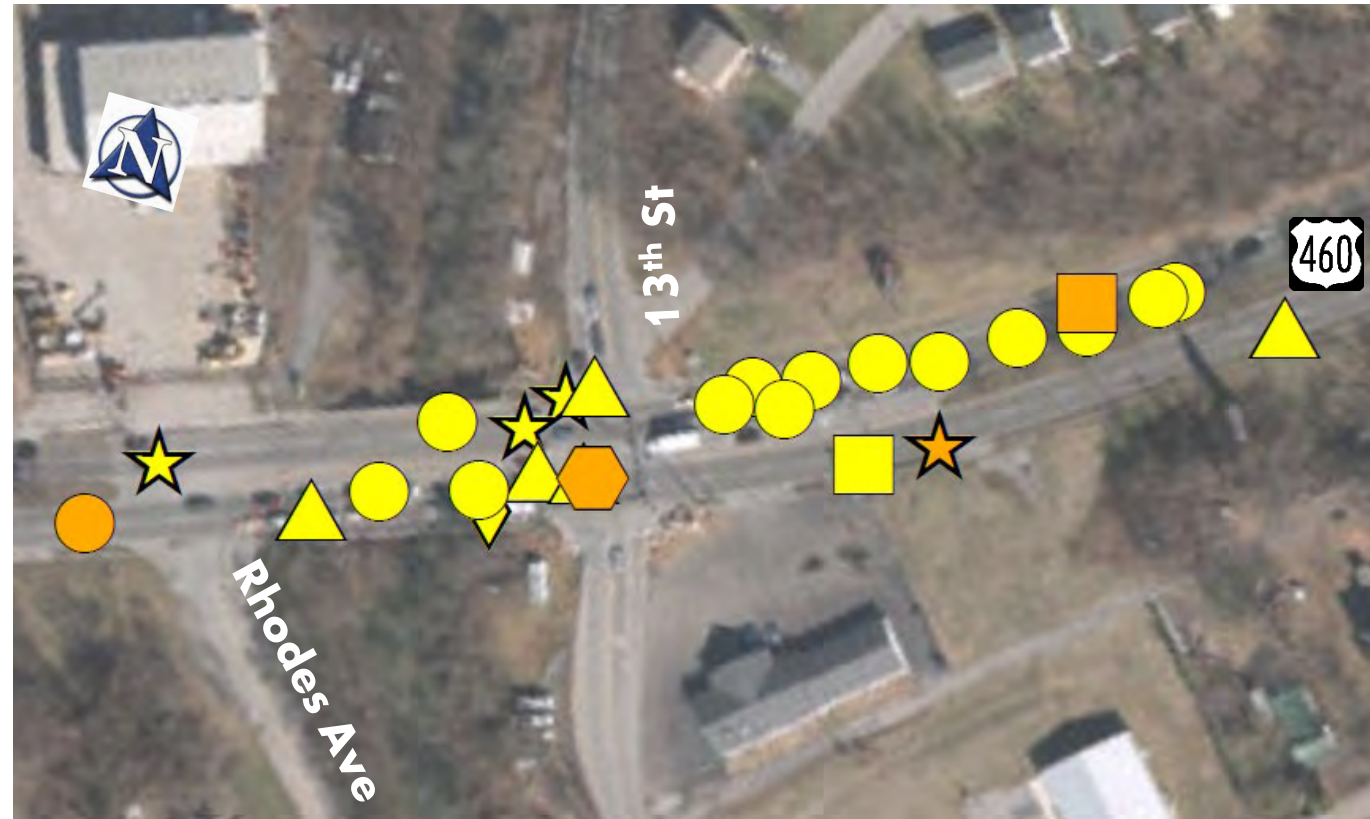
ROUTE 460 AT RHODES AVENUE AND 13TH STREET – SAFETY CONDITIONS

⑥ Rhodes Avenue - 2 crashes

- 1 rear end crash
- 1 sideswipe crash

⑦ 13th Street - 22 crashes

- 13 (59%) rear end crashes
 - 11 WB crashes
 - 2 EB crashes
- 2 angle crashes



Crash Type

- Rear End
- △ Angle
- ✱ Pedestrian
- ◇ Head On

Crash Type

- ☆ Sideswipe
- Fixed Object
- ◇ Deer/Other Animal
- ✱ Other

Crash Severity

- FATAL
- INJURY
- PROPERTY DAMAGE ONLY

ROUTE 460 AT RHODES AVENUE AND 13TH STREET – ALTERNATIVES CONSIDERED

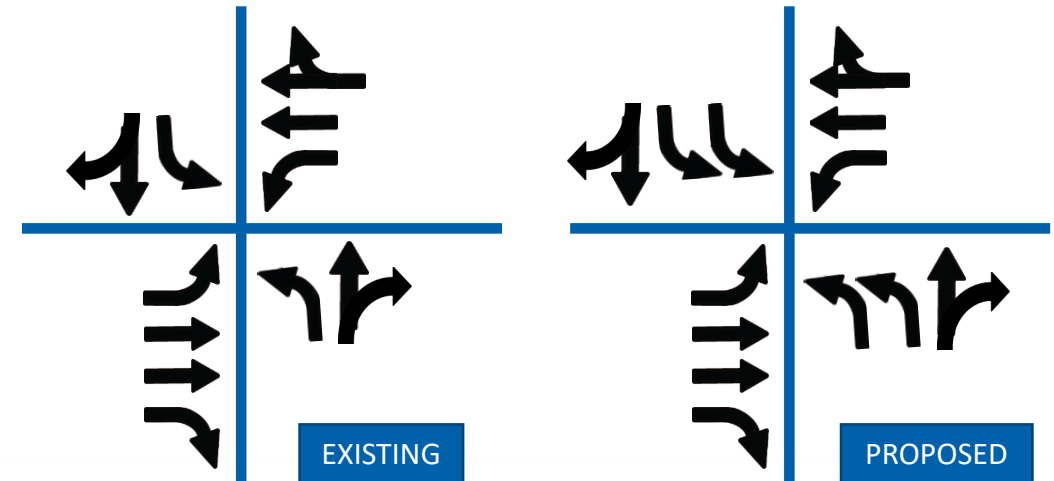
6 Rhodes Avenue

- RCUT
- Accommodate EB left-turn only
- Close median
 - Minimal NB and SB left turn/thru (≤ 1 vph) during peak periods
 - Consistent with Orange Avenue Widening project
 - Impacts United Rentals access

7 13th Street

- Widen SB approach to 3 lanes
- Widen NB approach to 3 lanes
- Widen NB and SB approaches to 3 lanes (RECOMMENDED)
 - Consistent with Orange Avenue Widening project

Route 460 at 13 th Street					
Option	LOS		Delay (sec)		Notable Delay Improvements (sec)
	AM	PM	AM	PM	
No Build	F	E	98	68	--
Widen NB and SB (split phasing)	D	D	55	52	AM: NBL: -45, SBL: -32, EBT: -18, WBT: -69 PM: NBL: -37, SBL: -107, EBT: -15
Widen NB and SB (protected-only phasing)	D	D	55	50	AM: NBL: -36, SBL: -28, EBT: -18, WBT: -67, SBT: -32 PM: NBL: -32, SBL: -130, EBT: -20

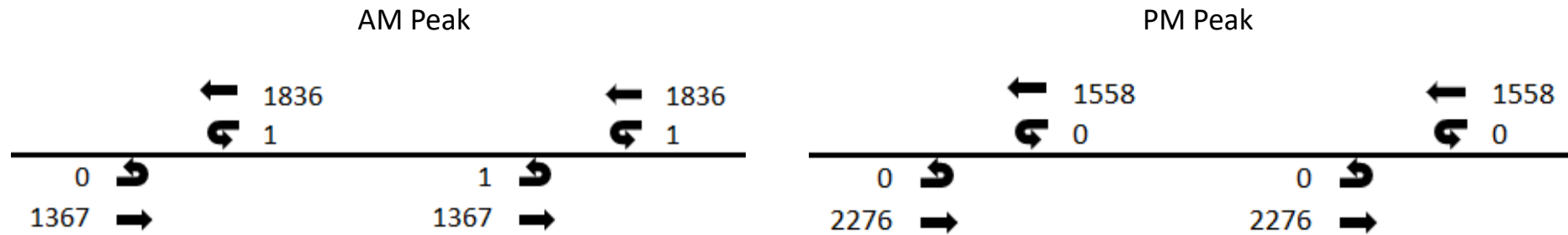


6 7 ROUTE 460 AT RHODES AVENUE AND 13TH STREET – POTENTIAL IMPROVEMENTS



8 9 ROUTE 460 AT TWO MEDIAN OPENINGS EAST OF 13TH STREET – TRAFFIC OPERATIONS

- 2040 Traffic Volumes



ROUTE 460 AT TWO MEDIAN OPENINGS EAST OF 13TH STREET – SAFETY CONDITIONS

⑧ Median Opening 660 ft east of 13th St - 1 crash

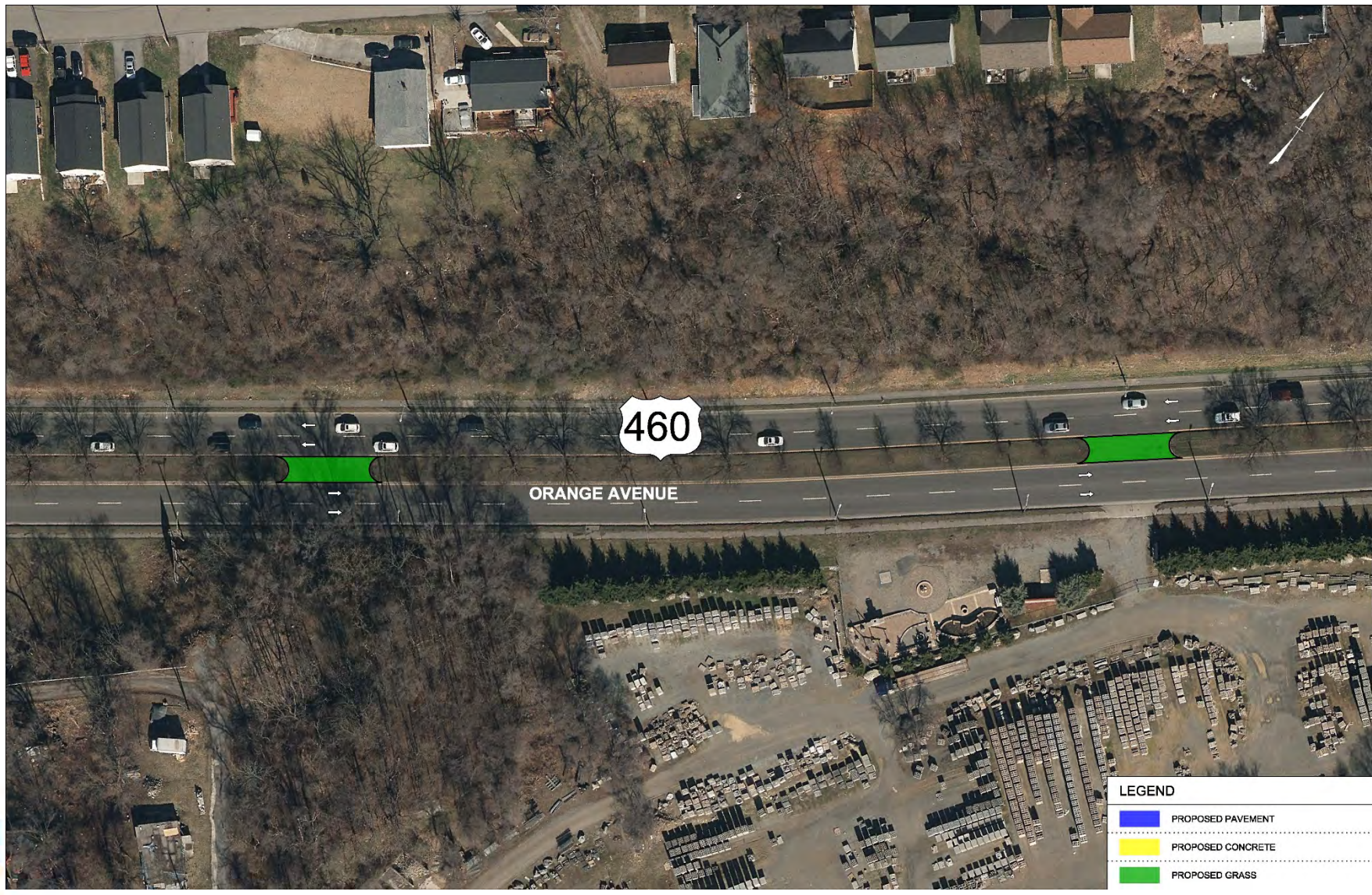
- 1 rear end crash (due to U-turn)

⑨ Median Opening 1,170 ft east of 13th St - 0 crashes

▪ Alternatives Considered

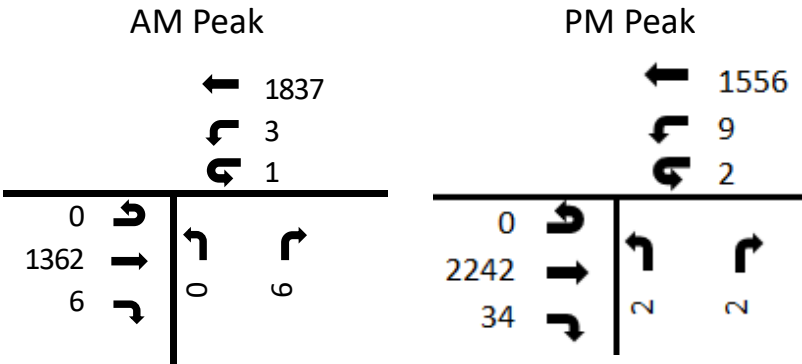
- Close both median openings (RECOMMENDED)
 - Median openings do not serve any occupied properties
 - Median openings do not have turn lanes

8 9 ROUTE 460 AT TWO MEDIAN OPENINGS EAST OF 13TH STREET – POTENTIAL IMPROVEMENTS



10 ROUTE 460 AT WALTON STREET – TRAFFIC OPERATIONS

2040 Traffic Volumes



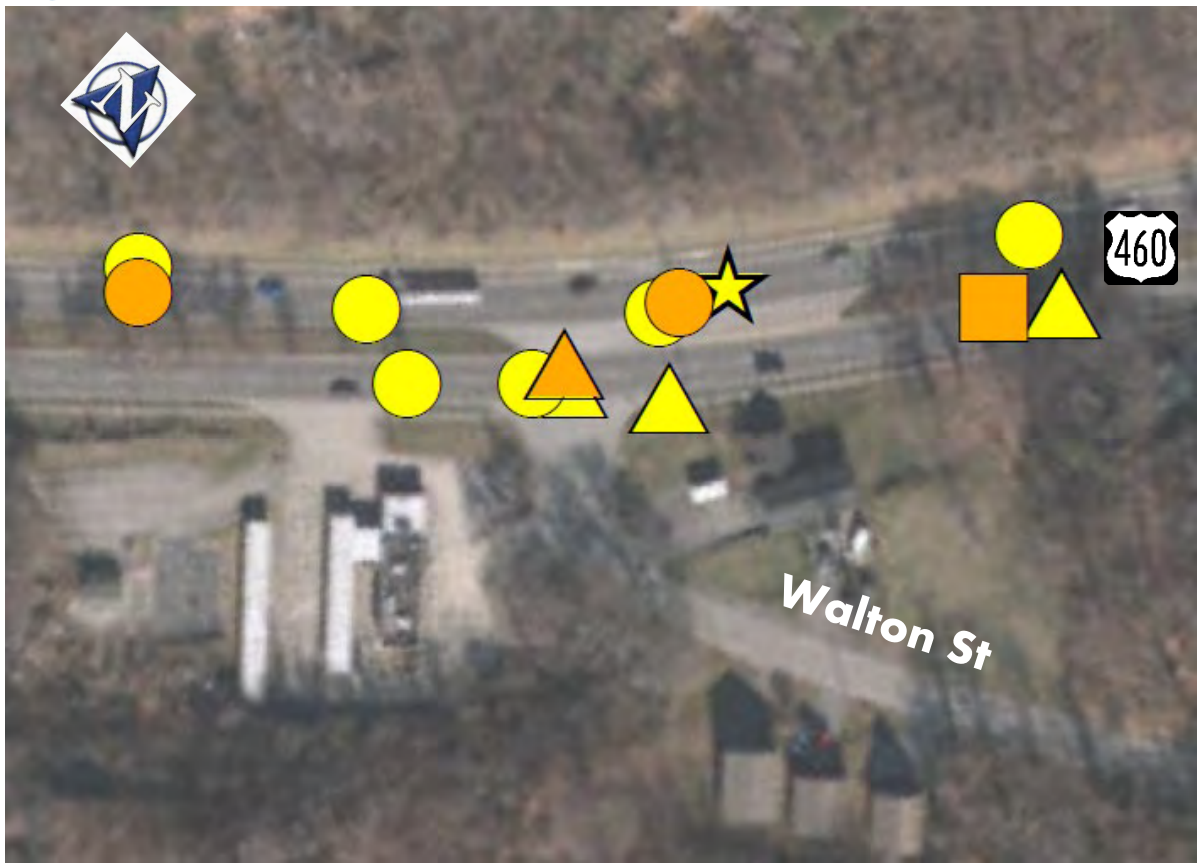
2040 No Build Traffic Operations

Peak Hour	WBL	NB
	Movement/Approach Delay (sec)	
AM	15	14
PM	35	89



10 ROUTE 460 AT WALTON STREET – SAFETY CONDITIONS

- 10 crashes
 - 6 rear end crashes
 - 3 angle crashes
 - 2 NBL / EBT crashes



Crash Type		☆	Sideswipe	Crash Severity	
○	Rear End	□	Fixed Object	■	FATAL
△	Angle	◇	Deer/Other Animal	■	INJURY
✱	Pedestrian	⊕	Other	■	PROPERTY DAMAGE ONLY
⬡	Head On				

10 ROUTE 460 AT WALTON STREET – ALTERNATIVES CONSIDERED

- **Accommodate WB left turn only; prohibit NB left turn (RECOMMENDED)**
 - Minimal NB left turns during peak periods (≤ 4 vph)
 - Access to Route 460 from Walton Street provided via 13th Street and Gus Nicks Boulevard
 - Reduces delay on the NB approach from 89 sec to 24 sec in PM peak hour
- **Close median opening**

10 ROUTE 460 AT WALTON STREET – POTENTIAL IMPROVEMENTS

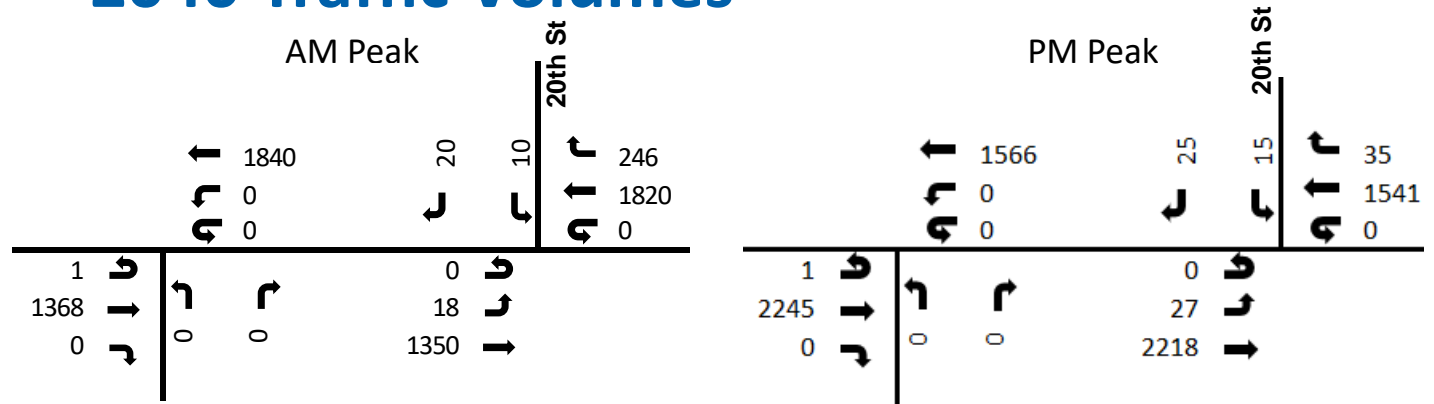


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12

ROUTE 460 AT MEDIAN OPENING WEST OF 20TH ST AND 20TH ST – TRAFFIC OPERATIONS

2040 Traffic Volumes



2040 No Build Traffic Operations

Route 460 at 20 th Street		
Peak Hour	EBL	SB
	Movement/Approach Delay (sec)	
AM	26	50
PM	15	34

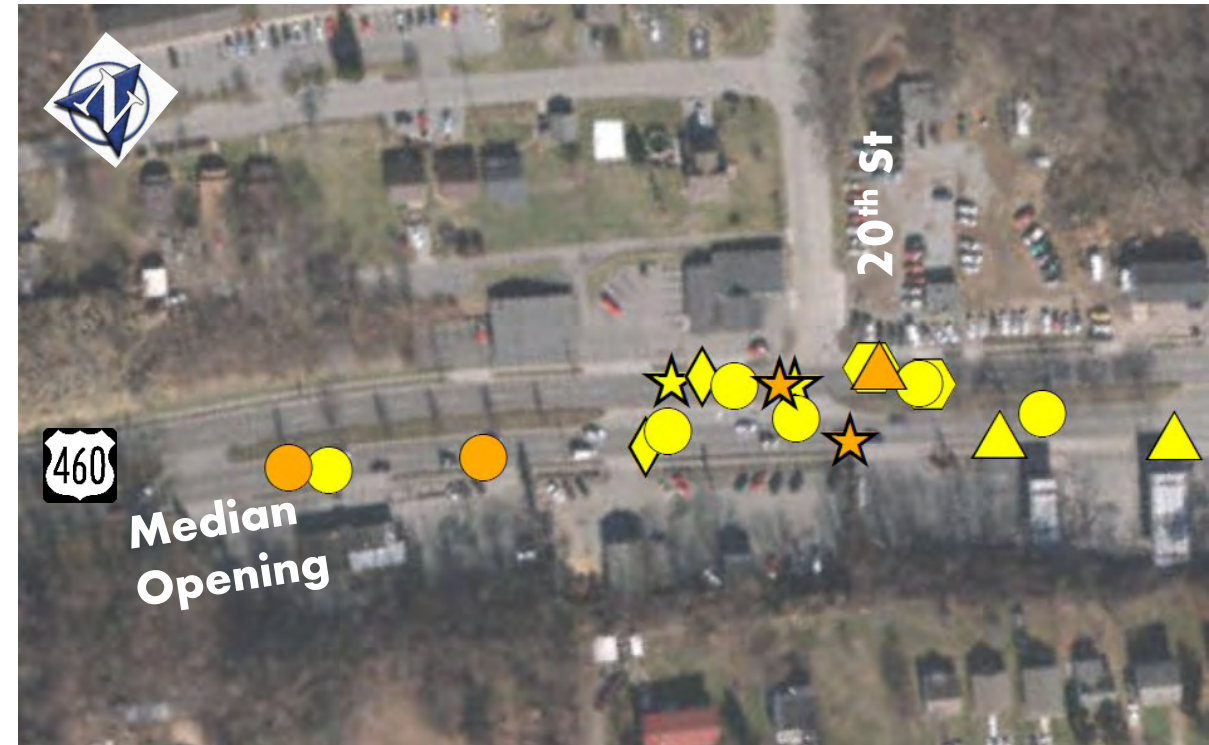


ROUTE 460 AT MEDIAN OPENING WEST OF 20TH ST AND 20TH ST – SAFETY CONDITIONS

11 Median Opening - 0 crashes

12 20th Street - 13 crashes

- 4 rear end crashes
- 4 sideswipe crashes
- 3 angle crashes
 - 1 SBL / EBT
 - 1 SBR / WBT
 - 1 EBL / WBT



Crash Type

- Rear End
- △ Angle
- ✱ Pedestrian
- ◇ Head On



Sideswipe



Fixed Object



Deer/Other Animal



Other

Crash Severity



FATAL



INJURY



PROPERTY DAMAGE ONLY

ROUTE 460 AT MEDIAN OPENING WEST OF 20TH ST AND 20TH ST – ALTERNATIVES CONSIDERED

11 Median Opening

- Close median opening (RECOMMENDED)
 - No turning movements recorded during peak hours
- Install WB left-turn lane and accommodate WB U-turn and bump out (*see Gus Nicks Road thru-cut option*)

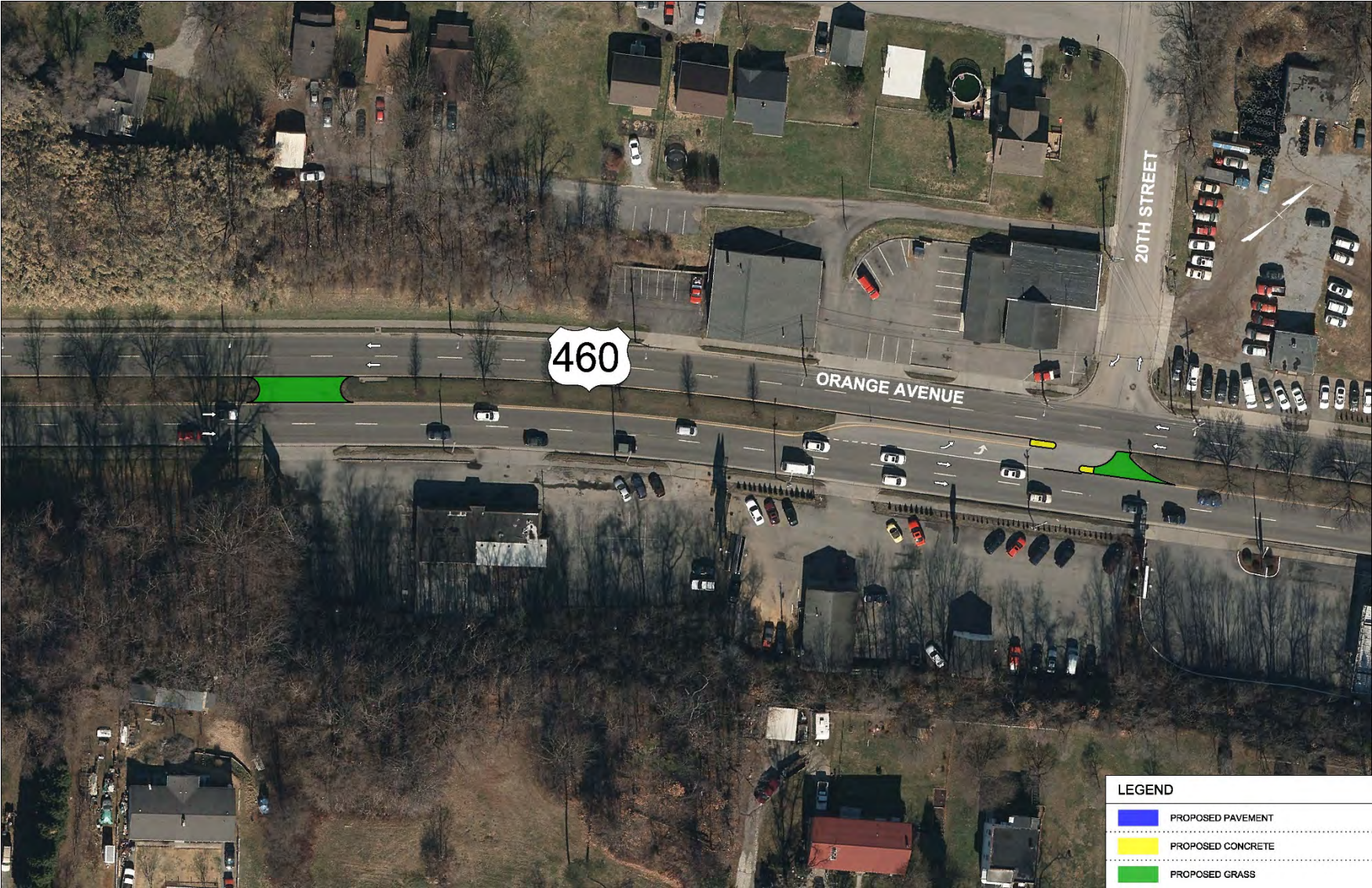
12 20th Street

- Close median opening
- Accommodate EB left-turn only (RECOMMENDED)
 - Minimal SB left turns during peak periods (≤ 15 vph)
 - SB left turn diverted to WB U-turn at Walton Street

Intersection	Movement	Delay and Travel Time (min)			
		No Build		Build (Rerouted)	
		AM	PM	AM	PM
20 th Street	SBL	0.8	0.6	1.8	2.8

11
12

ROUTE 460 AT MEDIAN OPENING WEST OF 20TH ST AND 20TH ST – POTENTIAL IMPROVEMENTS

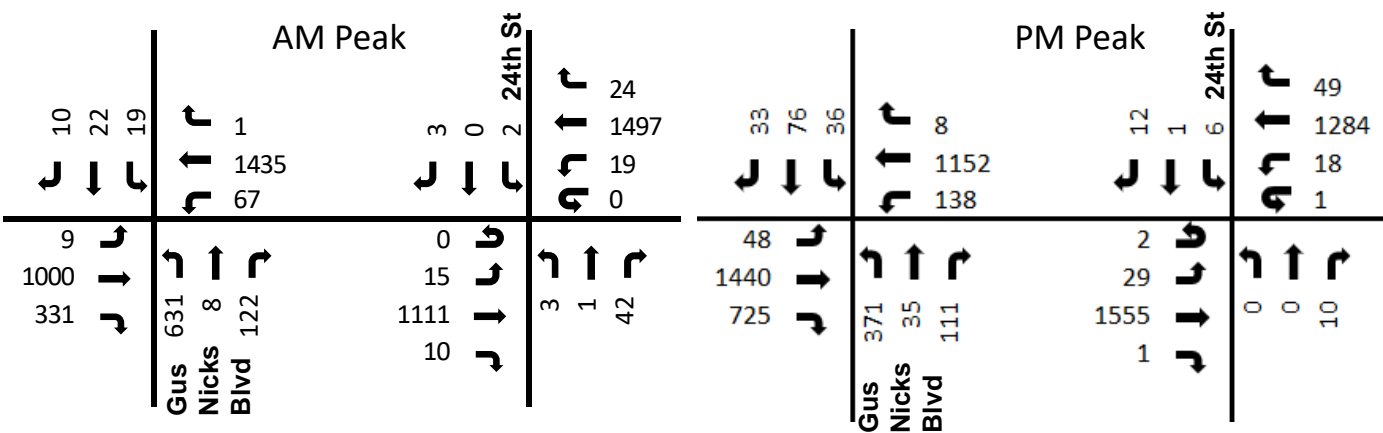


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14

ROUTE 460 AT GUS NICKS BOULEVARD AND 24TH STREET – TRAFFIC OPERATIONS

2040 Traffic Volumes



2040 No Build Traffic Operations

Peak Hour	Route 460 at Gus Nicks Boulevard							
	INT		EBT	WBT	EBL	WBL	NB	SB
	LOS	Delay	Movement/Approach Delay (sec)					
AM	E	71	31	56	114	173	150	87
PM	D	54	33	49	95	77	95	224



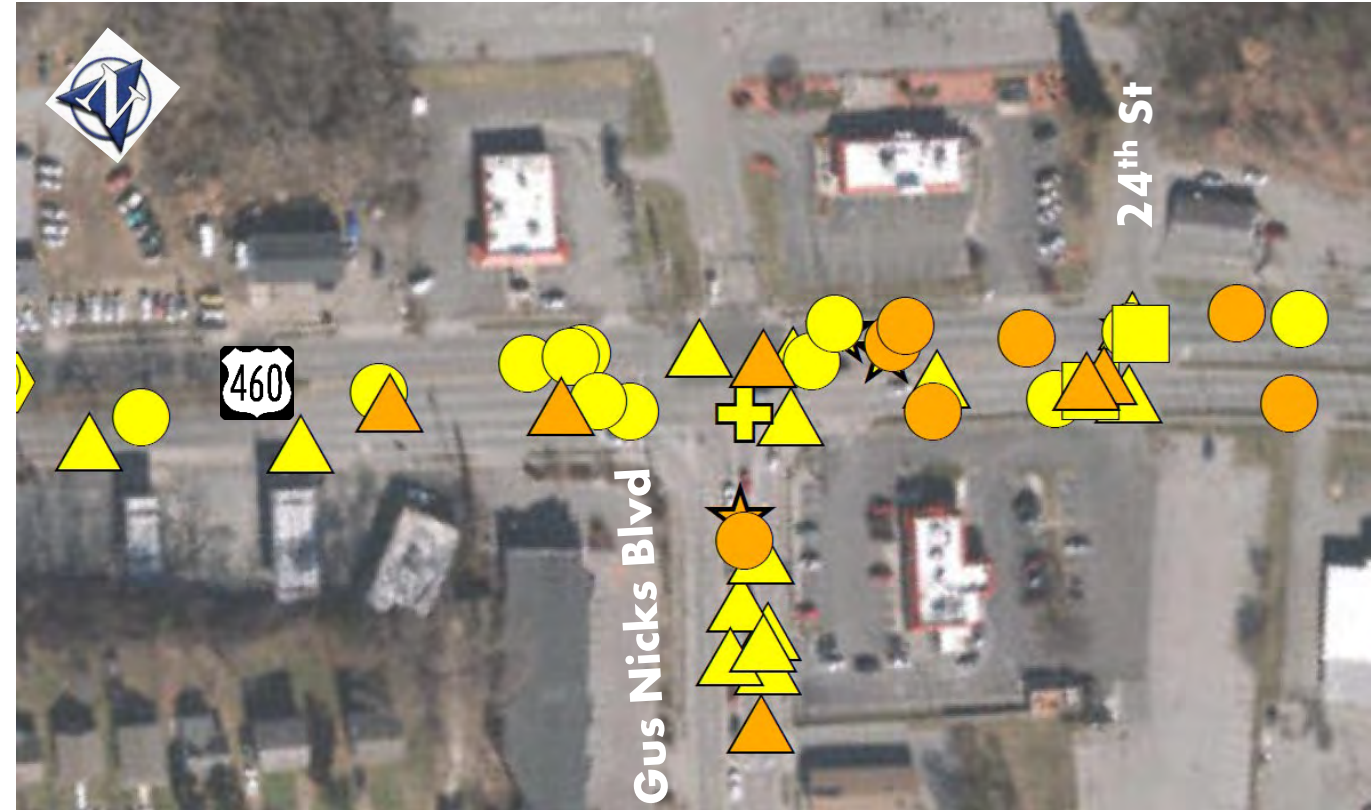
ROUTE 460 AT GUS NICKS BOULEVARD AND 24TH STREET – SAFETY CONDITIONS

13 Gus Nicks Blvd - 32 crashes

- 14 (44%) angle crashes
- 13 (41%) rear end crashes
 - 8 WB crashes
 - 4 EB crashes
- 1 bicycle crash (injury)

14 24th Street - 14 crashes

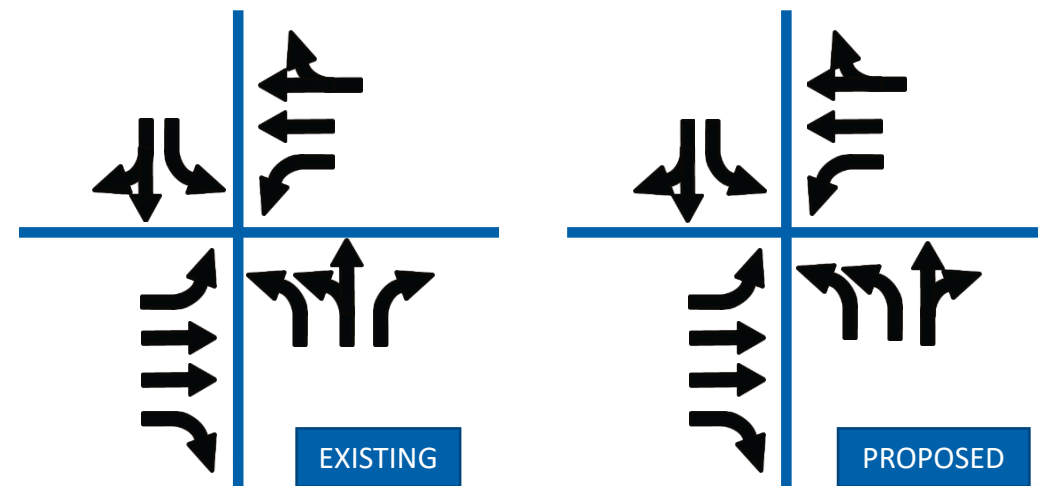
- 6 angle crashes
 - 1 EBL / WBT
 - 1 WBL / EBT
 - 1 NBL / EBT
 - 1 SBT / EBT
- 5 rear end crashes



13 ROUTE 460 AT GUS NICKS BOULEVARD – ALTERNATIVES CONSIDERED

- **Increase WB left-turn storage (RECOMMENDED)**
- **Change lane configuration on NB approach; concurrent phasing (RECOMMENDED)**
- **Prohibit NB/SB thru (Thru-Cut)**
 - Impacts Valley Metro route
 - SBT volume of 76 vph in PM peak
 - Long delays (420 sec) for WB U-turn at crossover west of 20th Street
 - NBT volume of 35 vph in PM peak
 - Divert to EB U-turn at Apartments

Route 460 at Gus Nicks Boulevard					
Option	LOS		Delay (sec)		Notable Delay Improvements (sec)
	AM	PM	AM	PM	
No Build	E	D	71	54	--
Modify NB Lane Config (Concurrent Phasing)	E	D	59	52	AM: NBL: -137, SBTR: -11, WBL: -38 PM: NBL: -55, SBTR: -141
NB/SB Thru-Cut	D	D	48	37	AM: NBL: -157, EBL: -21, WBL: -60, WBT: -14 PM: NBL: -64, EBL: -35, WBT: -36



14 ROUTE 460 AT 24TH STREET – ALTERNATIVES CONSIDERED

■ Close median opening (RECOMMENDED)

- EB left turn (31 vph during PM peak) diverted to 20th Street or U-turn at Apartments
- WB left turn (19 vph during AM peak, 18 vph during PM peak) diverted to WBL at Gus Nicks Blvd
- NB through/left-turn (≤ 4 vph) diverted to U-turn at Apartments
- SB through/left-turn (≤ 7 vph) diverted to WB U-turn at Gus Nicks Blvd (movement currently prohibited due to WBL-NBR overlap)

■ Accommodate WB left-turn only

- Provides minimal increase in WB left-turn lane to Gus Nicks Boulevard

Intersection	Movement	Delay and Travel Time (min)			
		No Build		Build (Rerouted)	
		AM	PM	AM	PM
24 th Street	NBL	0.6	0.3	3.4	1.5
	SBL	1.9	7.2	3.1	2.2
	EBL	0.2	0.2	3.1	1.3

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14

ROUTE 460 AT GUS NICKS BOULEVARD AND 24TH STREET – POTENTIAL IMPROVEMENTS



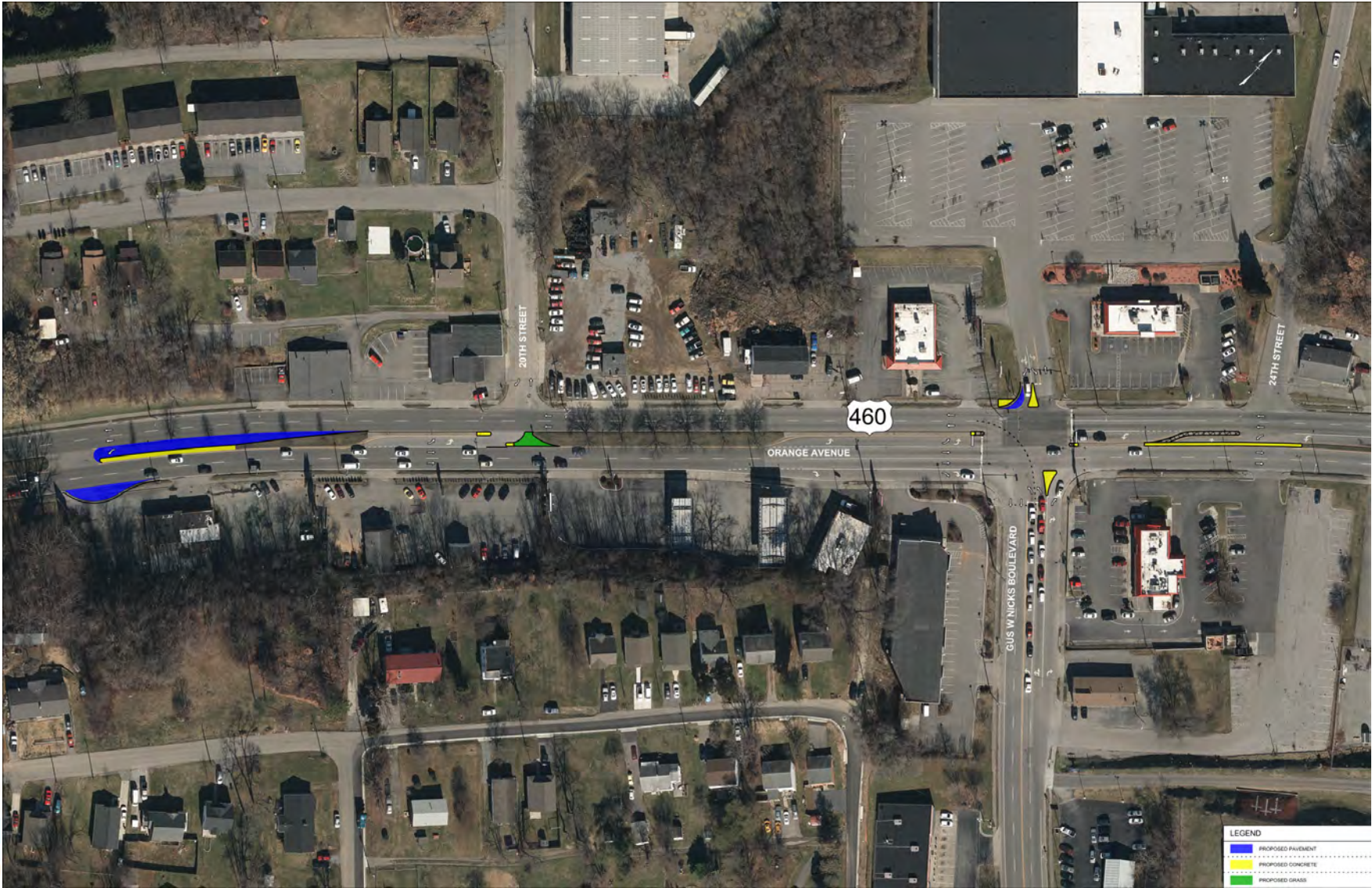
11 13
12 14

ROUTE 460 AT MEDIAN OPENING WEST OF 20TH STREET TO 24TH STREET – POTENTIAL IMPROVEMENTS



11 13
12 14

ROUTE 460 AT MEDIAN OPENING WEST OF 20TH STREET TO 24TH STREET – POTENTIAL IMPROVEMENTS



15 ROUTE 460 AT TWO MEDIAN OPENINGS EAST OF 24TH STREET – TRAFFIC OPERATIONS

16

2040 Traffic Volumes

AM Peak				PM Peak			
Approach		Apartment		Approach		Apartment	
EBL	52	WBL	49	EBL	35	WBL	26
NB	0	NB	0	NB	0	NB	0
SB	16	SB	16	SB	8	SB	8
Intersection		Intersection		Intersection		Intersection	
EBL	10	WBL	5	EBL	16	WBL	15
NB	1487	NB	1444	NB	1305	NB	1292
SB	0	SB	7	SB	11	SB	3
Left Turn	2	Left Turn	0	Left Turn	1	Left Turn	3
Right Turn	1	Right Turn	6	Right Turn	9	Right Turn	8
Through	4	Through	0	Through	1	Through	0
Left Turn	1	Left Turn	7	Left Turn	1	Left Turn	14
Right Turn	1	Right Turn	7	Right Turn	1	Right Turn	14
Through	1093	Through	1088	Through	1482	Through	1436
Left Turn	36	Left Turn	7	Left Turn	32	Left Turn	6
Right Turn		Right Turn		Right Turn		Right Turn	



2040 No Build Traffic Operations

Peak Hour	Route 460 at Median Opening 1				Route 460 at Median Opening 2			
	EBL	WBL	NB	SB	EBL	WBL	NB	SB
	Movement/Approach Delay (sec)							
AM	18	20	47	41	13	11	24	29
PM	14	15	64	23	16	22	48	26

ROUTE 460 AT TWO MEDIAN OPENINGS EAST OF 24TH STREET – SAFETY CONDITIONS

15 Median Opening 990 ft east of 24th St - 2 crashes

- 1 angle crash
- 1 sideswipe crash

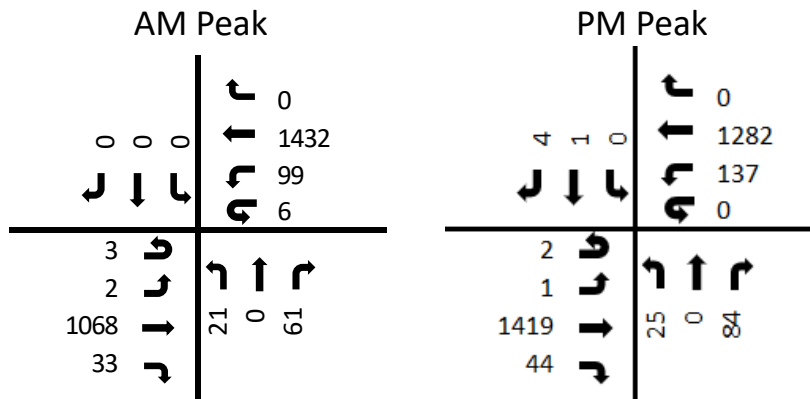
16 Median Opening 1,730 ft east of 24th St - 0 crashes

▪ Recommendation

- Monitor conditions at both median openings as District Vue Apartments become fully occupied

17 ROUTE 460 AT MECCA STREET – TRAFFIC OPERATIONS

■ 2040 Traffic Volumes



- **2040 No Build Traffic Operations**
(includes signal proposed by Richfield Living)

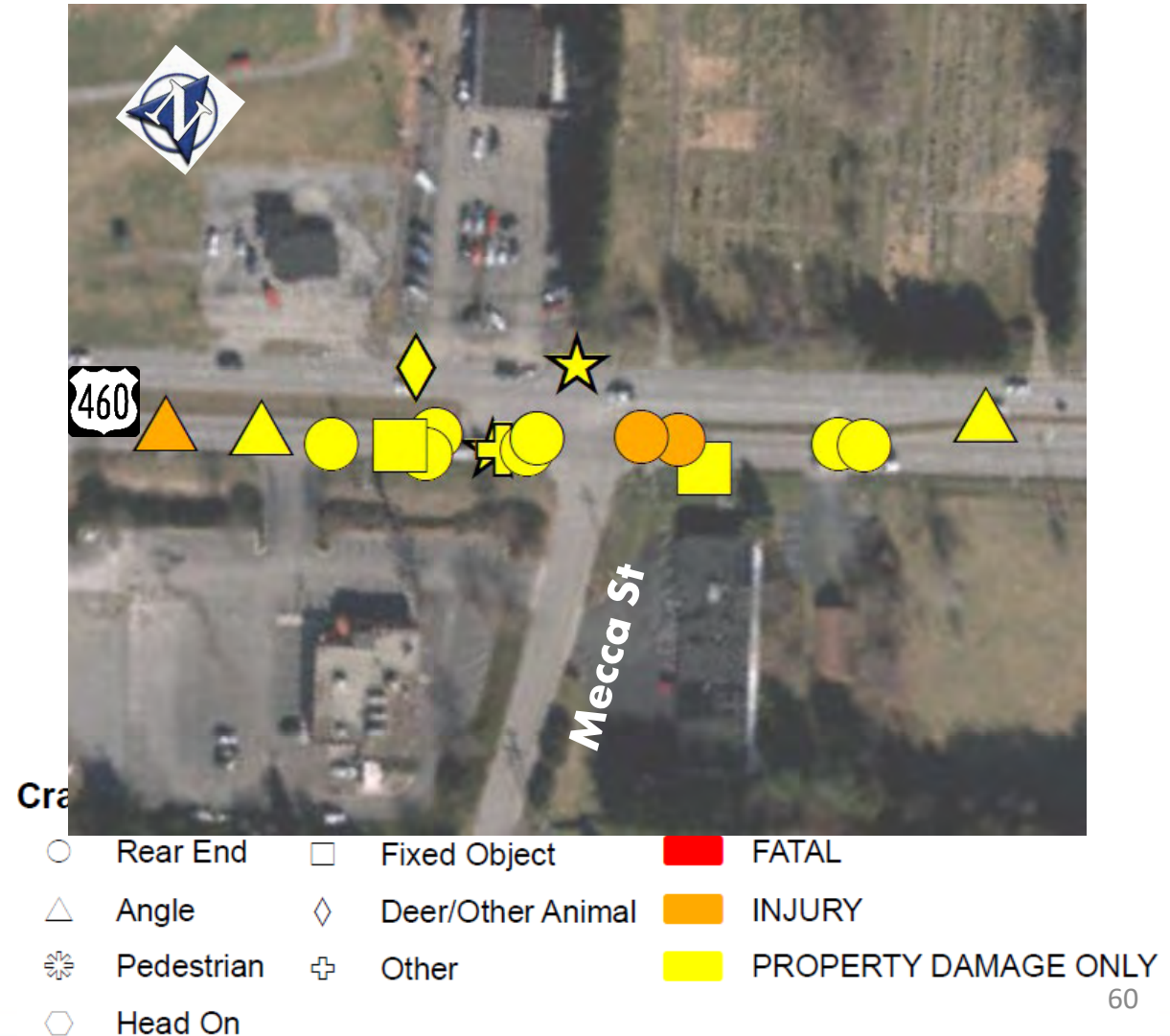
Peak Hour	INT		EBT	WBT	WBL	NB	SB
	LOS	Delay	Movement/Approach Delay (sec)				
AM	A	10	18	1	1	75	0
PM	A	8	2	1	66	81	75



17 ROUTE 460 AT MECCA STREET – SAFETY CONDITIONS

■ 14 crashes

- 8 rear end crashes (some reports referenced unexpected stopping for emergency signal)
- 2 angle crashes
- 2 sideswipe crashes



17 ROUTE 460 AT MECCA STREET – ALTERNATIVES CONSIDERED

■ No Build Improvements

- Signal planned as part of Richfield Living

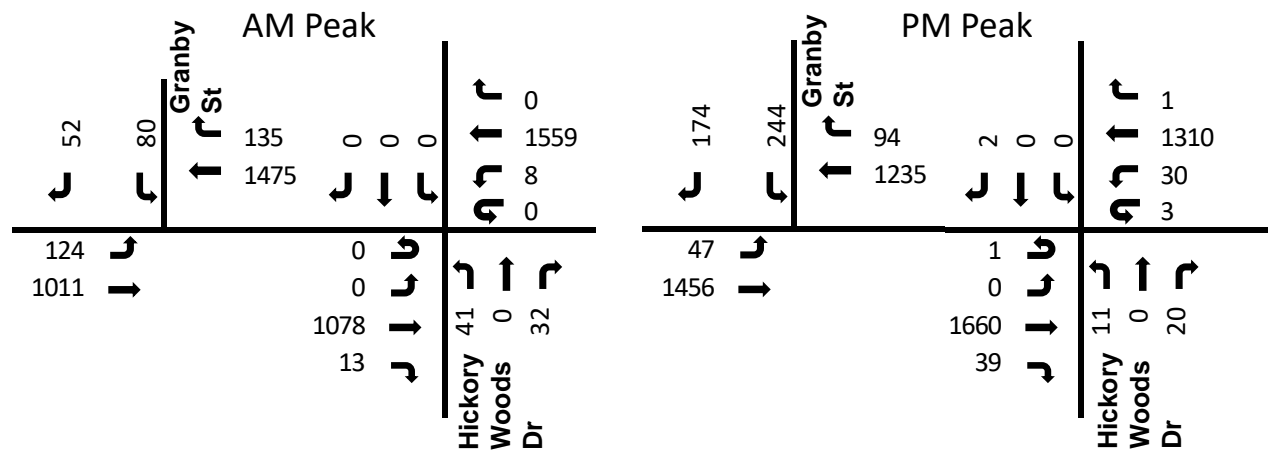
■ Recommendation

- No additional improvements
 - Intersection operates at LOS A
- Monitor conditions as Richfield Living becomes fully occupied

18
19

ROUTE 460 AT GRANBY STREET AND HICKORY WOODS DRIVE – TRAFFIC OPERATIONS

2040 Traffic Volumes



2040 No Build Traffic Operations

Peak Hour	Route 460 at Granby Street					
	INT		EBT	WBT	EBL	SB
	LOS	Delay	Movement/Approach Delay (sec)			
AM	B	11	2	6	78	67
PM	C	27	4	39	8	67

Route 460 at Hickory Woods Drive				
Peak Hour	EBL	WBL	NB	SB
	Movement/Approach Delay (sec)			
AM	0	11	34	0
PM	24	20	41	14

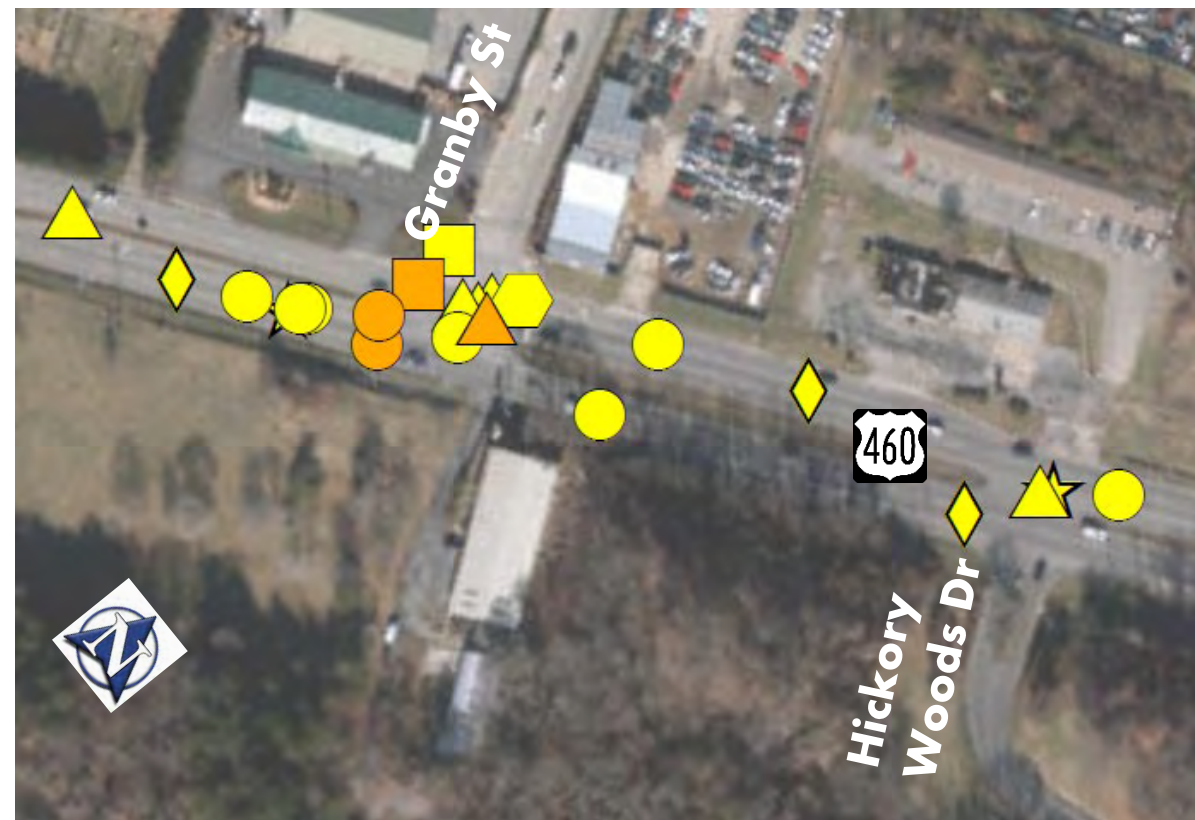
ROUTE 460 AT GRANBY STREET AND HICKORY WOODS DRIVE – SAFETY CONDITIONS

18 Granby Street - 19 crashes

- 9 rear end crashes
 - 8 EB crashes
 - 1 WB crash
- 5 angle crashes

19 Hickory Woods Drive - 3 crashes

- 1 rear end crash
- 1 angle crash
- 1 sideswipe crash



Crash Type

- Rear End
- △ Angle
- ✱ Pedestrian
- ◇ Head On



Sideswipe



Fixed Object



Deer/Other Animal



Other

Crash Severity



FATAL



INJURY



PROPERTY DAMAGE ONLY

ROUTE 460 AT GRANBY STREET AND HICKORY WOODS DRIVE – ALTERNATIVES CONSIDERED

18 Granby Street

- Install SB double left-turn lane
 - High SB left-turn volume during PM peak
 - Substantial impacts to widen SB approach
- No improvements (RECOMMENDED)
 - Intersection operates at LOS B/C

19 Hickory Woods Drive

- Accommodate WB left-turn only
 - NB left-turns would be diverted to U-turn at Siebel Drive
 - High NB left-turn during AM peak (41 vph)
- No improvements (RECOMMENDED)
 - Minimal crash history



Looking North along Granby Street

20

21

ROUTE 460 AT SEIBEL DR AND MEDIAN OPENING EAST OF SEIBEL DR – TRAFFIC OPERATIONS

2040 Traffic Volumes

AM Peak				PM Peak			
Seibel Dr				Seibel Dr			
4	21	50	0	32	46	22	0
↶	↶	↶	↶	↶	↶	↶	↶
1556	0	1604	3	1311	4	1329	2
0	0	3	3	0	0	2	2
0	0	0	0	0	0	0	0
2	29	2	2	1	2	6	0
↷	↷	↷	↷	↷	↷	↷	↷
1079	1091	0	0	1680	1728	0	0
↶	↶	↶	↶	↶	↶	↶	↶
0	0	2	2	1	1	2	2
↷	↷	↷	↷	↷	↷	↷	↷

2040 No Build Traffic Operations

Route 460 at Seibel Drive		
Peak Hour	EBL	SB
	Movement/Approach Delay (sec)	
AM	18	51
PM	17	49



ROUTE 460 AT SEIBEL DR AND MEDIAN OPENING EAST OF SEIBEL DR – ALTERNATIVES CONSIDERED

20 Seibel Drive

- Close median opening
- Accommodate EB left-turn only
- No improvements (RECOMMENDED)
 - Minimal crash history
 - Diversion of additional industrial traffic to Granby Street not desirable

21 Median Opening East of Seibel Drive

- Close median opening
- Accommodate EB left-turn only
- No improvements (RECOMMENDED)
 - Minimal crash history
 - Rerouting of truck traffic not desirable



22 ROUTE 460 AT KING STREET – TRAFFIC OPERATIONS

2040 Traffic Volumes

AM Peak				PM Peak			
30	24	43	69	12	40	34	41
↙	↓	↘	↑	↙	↓	↘	↑
			1432				1167
			286				408
46	↘			36	↘		
926	↘	↙	↑	1448	↘	↙	↑
114	↘		402	258	↘		452
		138	21			144	9

2040 No Build Traffic Operations (includes SMART SCALE improvements)

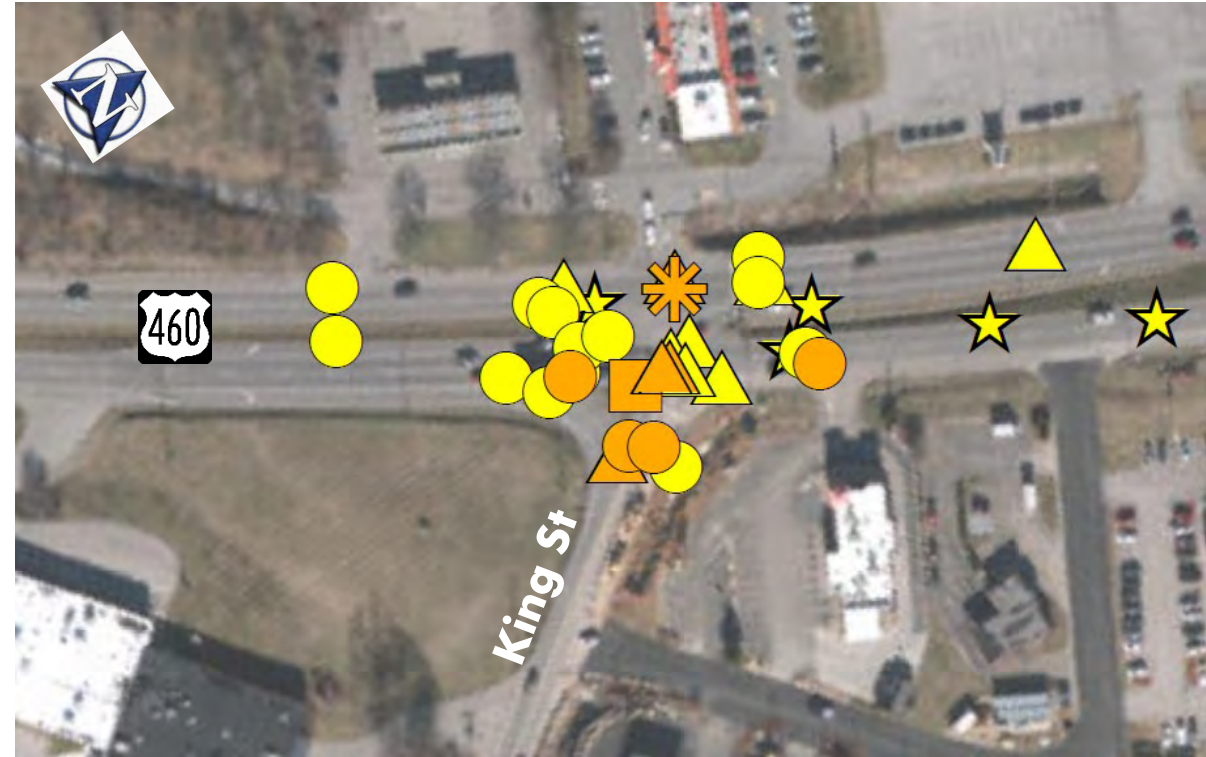
Peak Hour	INT		EBT	WBT	EBL	WBL	NB	SB
	LOS	Delay	Movement/Approach Delay (sec)					
AM	D	53	62	52	75	60	46	86
PM	E	64	75	21	41	110	103	148



22 ROUTE 460 AT KING STREET – SAFETY CONDITIONS

■ 32 crashes

- 16 (50%) rear end crashes
 - 9 EB crashes
 - 4 WB crashes
- 11 angle crashes
- 1 pedestrian crash (visible injury)



Crash Type

- Rear End
- △ Angle
- ✱ Pedestrian
- ◇ Head On



Sideswipe



Fixed Object



Deer/Other Animal



Other

Crash Severity



FATAL



INJURY



PROPERTY DAMAGE ONLY

22 ROUTE 460 AT KING STREET – ALTERNATIVES CONSIDERED

■ No Build Improvements (SMART SCALE)

- Extend westbound left-turn lane
- Offset EB and WB left-turn lanes; install FYA
- Construct new sidewalk, crosswalk, and pedestrian push buttons

■ Alternatives Considered

- Thru-cut (prohibit NB and SB thru)
 - 40 SB thru vehicles diverted to other commercial driveways or WB U-turn west of King Street
 - 21 NB thru vehicles diverted to EB U-turn at Lynn Brae Drive
- WB double left-turn lane
 - Significant impacts along King Street to provide two receiving lanes
- NB double right-turn lane



Option	LOS		Delay (sec)		Notable Delay Improvements (sec)
	AM	PM	AM	PM	
No Build	D	E	53	64	--
NB/SB Thru-Cut	D	D	36	39	AM: WBL: -39, WBT: -13, EBT: -21 PM: WBL: -38, WBT: -10, EBT: -35

23

24

ROUTE 460 AT LYNN BRAE DRIVE AND PATRICK ROAD – TRAFFIC OPERATIONS

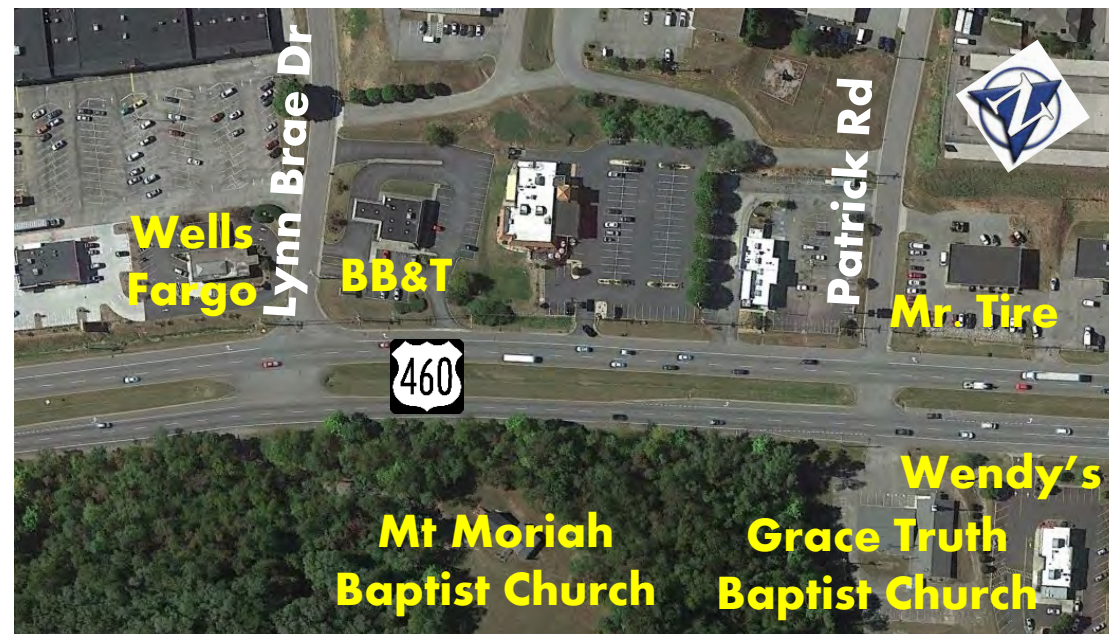
2040 Traffic Volumes

AM Peak				PM Peak			
Lynn Brae Dr		Patrick Rd		Lynn Brae Dr		Patrick Rd	
9	0	22	37	34	0	43	44
0	1735	23	1720	0	1566	36	21
0	0	0	0	0	0	0	1
3	3	19	1	10	10	21	11
3	0	2	0	6	0	3	0
23	0	44	0	26	0	31	0
1335	0	1314	0	1912	0	1931	0
0	0	0	0	0	0	0	0

2040 No Build Traffic Operations

Peak Hour	Route 460 at Lynn Brae Drive			Route 460 at Patrick Road			
	EBL	WBL	SB	EBL	WBL	NB	SB
	Movement/Approach Delay (sec)						
AM	22	25	83	22	25	0	117
PM	19	55	*	18	63	0	*

* Delay exceeds HCM limits



ROUTE 460 AT LYNN BRAE DRIVE AND PATRICK ROAD – SAFETY CONDITIONS

23 Lynn Brae Drive - 13 crashes

- 9 angle crashes
 - 7 SBL / WBT
 - 1 EBL / WBT
- 4 rear end crashes

24 Patrick Road - 7 crashes

- 4 angle crashes
 - 1 SBL / EBT
 - 1 SBL / WBT
 - 1 EBL / WBT
- 2 rear end crashes



Crash Type

- Rear End
- △ Angle
- ⊛ Pedestrian
- ◇ Head On



Sideswipe



Fixed Object



Deer/Other Animal



Other

Crash Severity



FATAL



INJURY



PROPERTY DAMAGE ONLY

ROUTE 460 AT LYNN BRAE DRIVE AND PATRICK ROAD – ALTERNATIVES CONSIDERED

23

Lynn Brae Drive

- RCUT with WB left-turn lane
 - SB left turn (43 vph during PM peak) diverted to King Street
 - Diversion of traffic to King Street increases delay; WB U-turn at King Street is currently prohibited
- No improvements
 - Does not divert traffic to King Street

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Patrick Road

- RCUT with WB left-turn lane
 - SB left turn (21 vph during PM peak) diverted to Lynn Brae Drive
 - Providing WB left-turn provides access to church and other commercial properties
 - NBL from Grace Truth Baptist Church diverted to Blue Hills Village Dr to U-turn
- Accommodate EB left-turn only
 - WB left turn (12 vph during PM peak) diverted to Lynn Brae Drive
 - NBL from Grace Truth Baptist Church diverted to Blue Hills Village Dr to U-turn
- No improvements
 - Does not divert traffic to Lynn Brae Drive or Blue Hills Village Dr

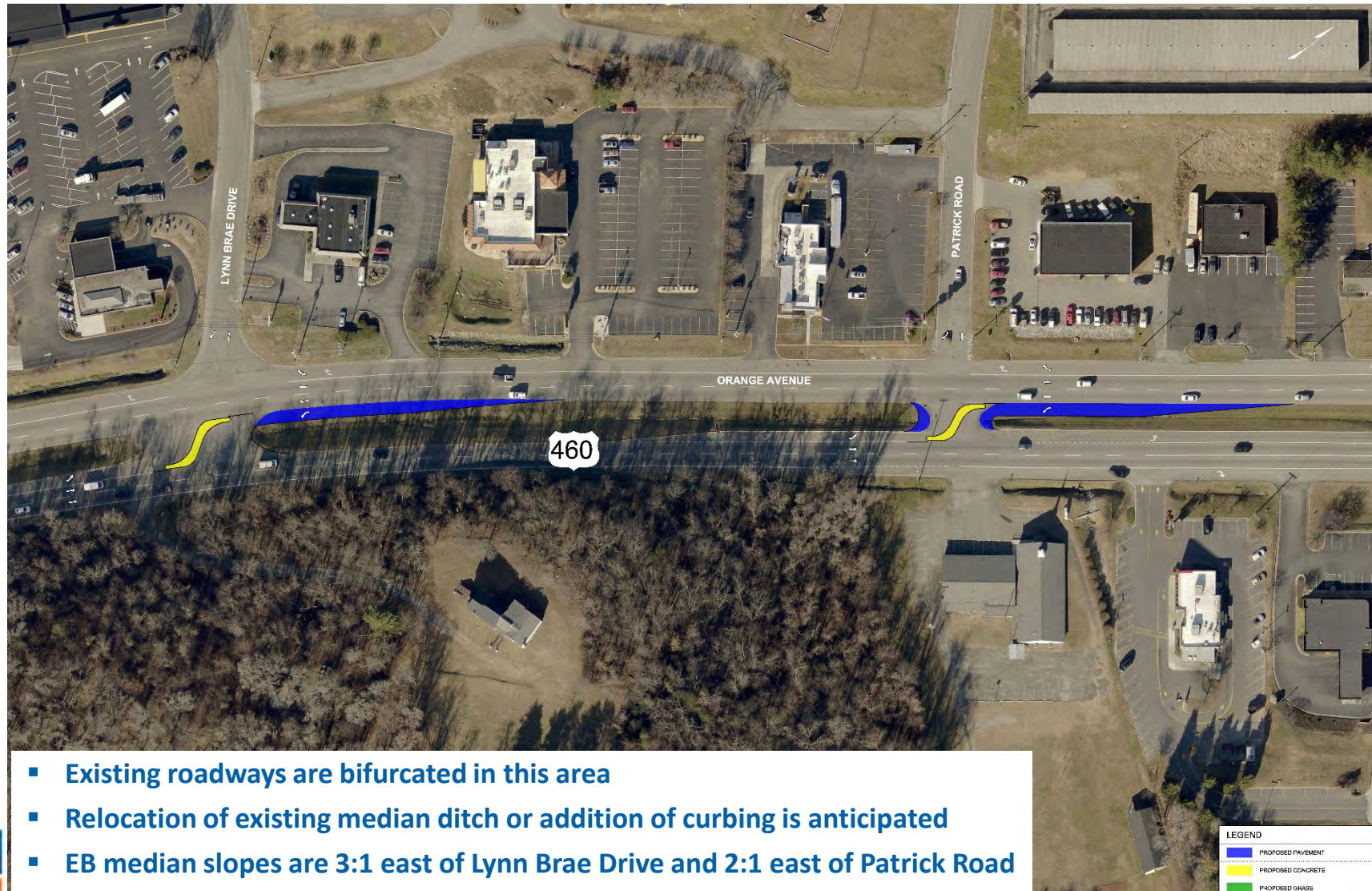
Intersection	Movement	Delay and Travel Time (min)			
		No Build		Build (Rerouted)	
		AM	PM	AM	PM
Lynn Brae Dr	SBL	1.4	*	3.0	5.2
Patrick Rd	SBL	1.9	*	1.5	4.9

* Delay Exceeds HCM Limits

Intersection	Movement	LOS		Delay (sec)	
		AM	PM	AM	PM
King Street (No Build)	WBL	E	F	60	110
	Overall	D	E	53	64
King Street (with Lynn Brae RCUT)	WBL-U	E	F	65	141
	Overall	E	E	62	68

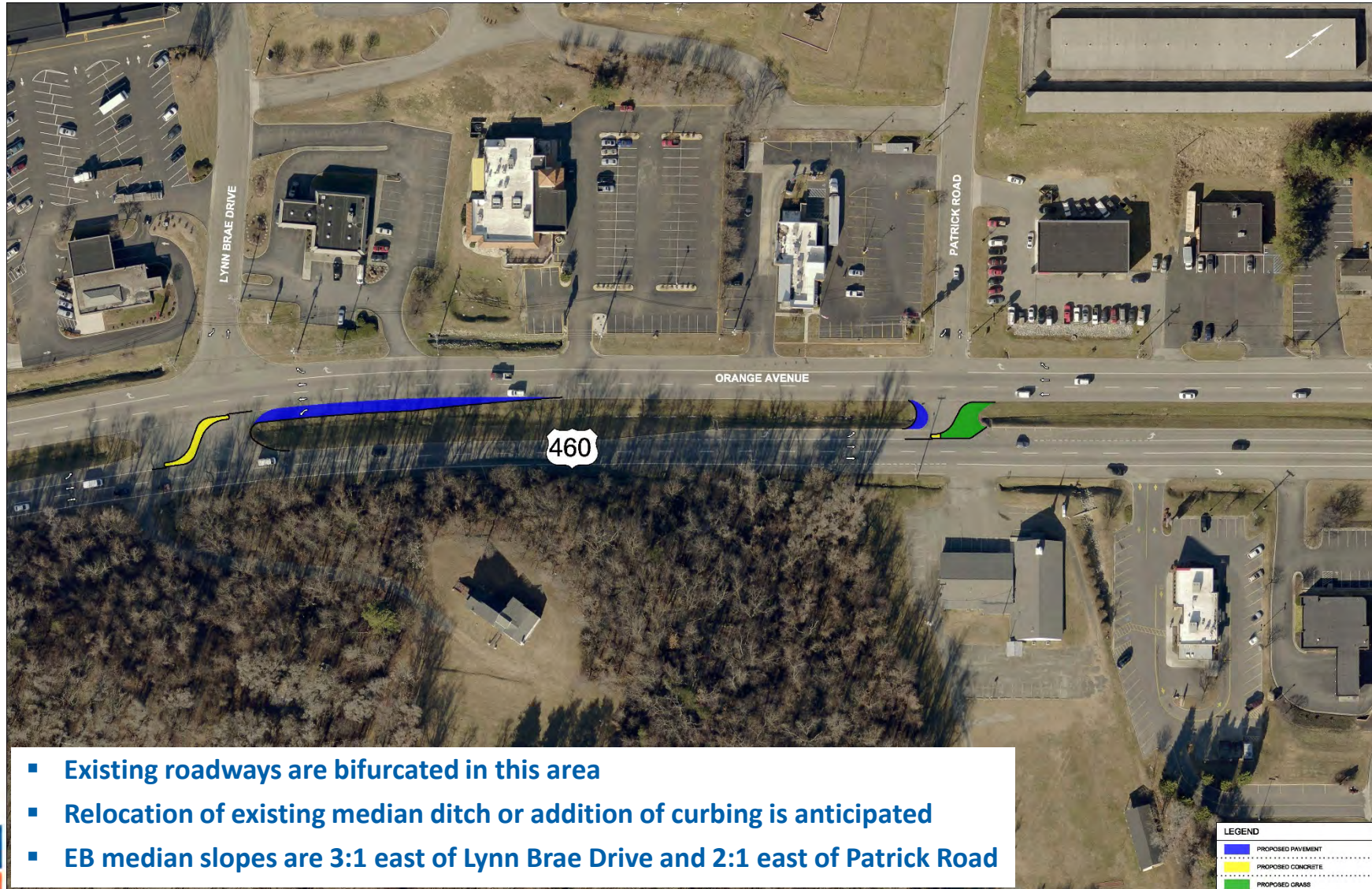
23 ROUTE 460 AT LYNN BRAE DRIVE AND PATRICK ROAD — POTENTIAL IMPROVEMENTS

24



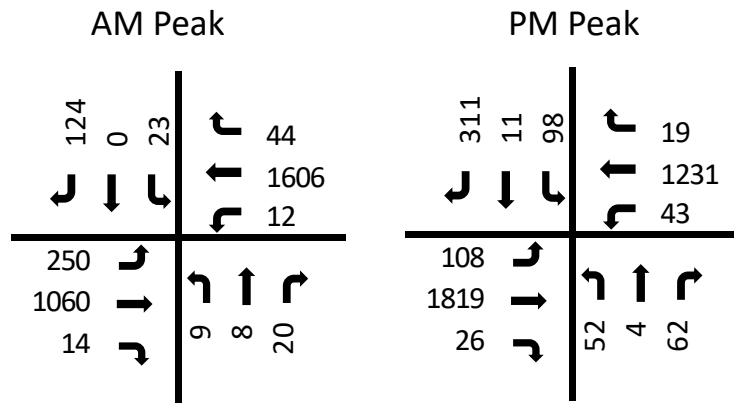
23 ROUTE 460 AT LYNN BRAE DRIVE AND PATRICK ROAD — POTENTIAL IMPROVEMENTS

24



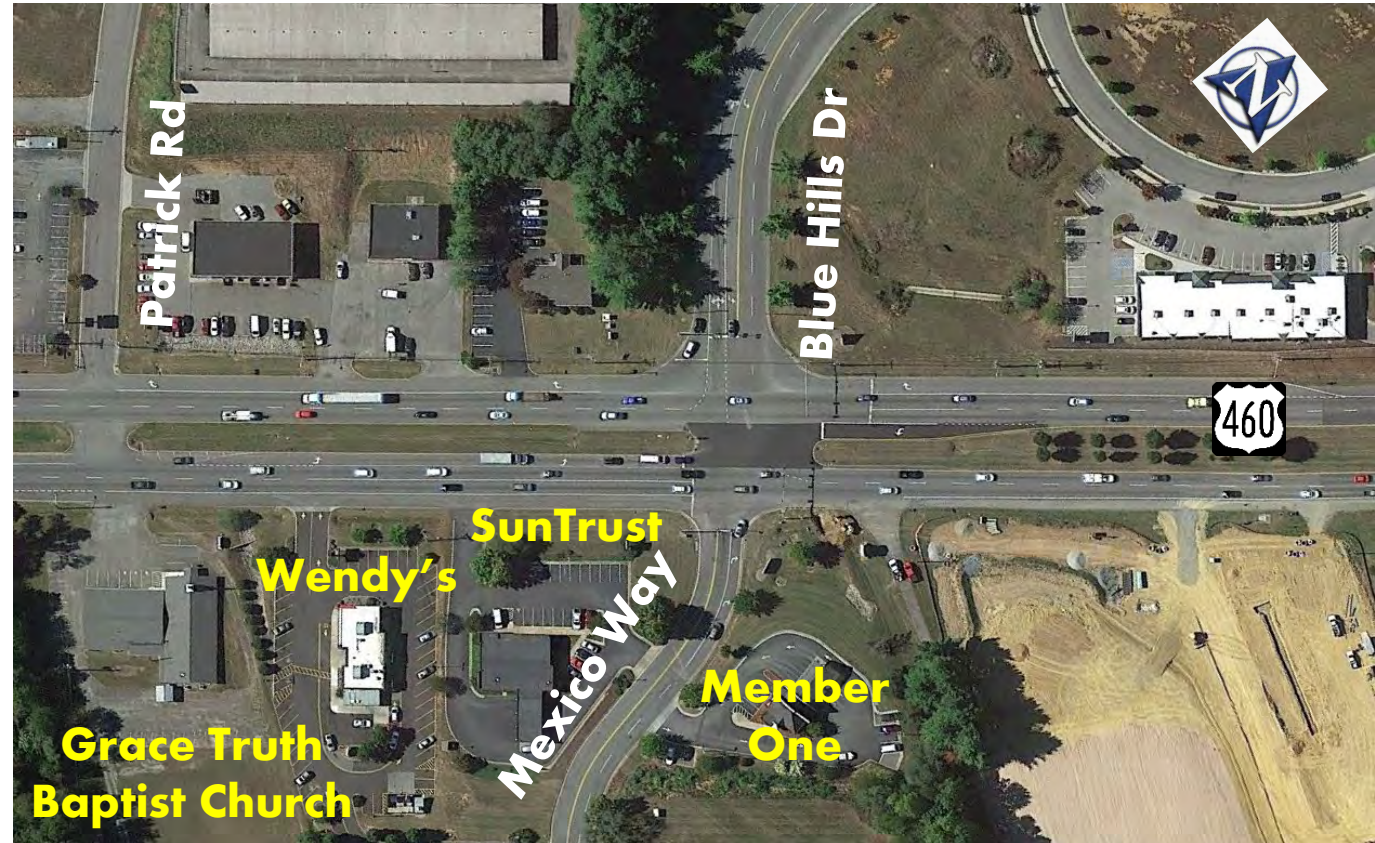
25 ROUTE 460 AT BLUE HILLS DRIVE/MEXICO WAY – TRAFFIC OPERATIONS

2040 Traffic Volumes



2040 No Build Traffic Operations

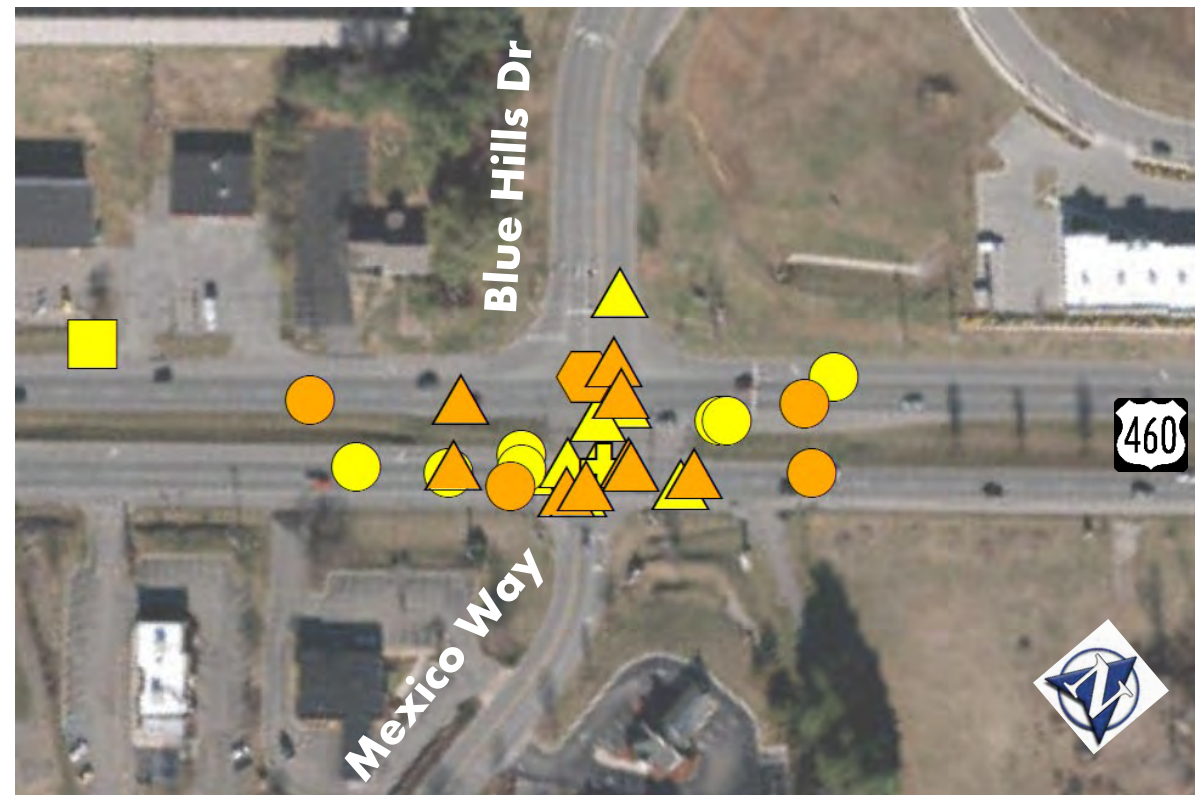
Peak Hour	INT		EBT	WBT	EBL	WBL	NB	SB
	LOS	Delay						
AM	D	36	13	34	112	8	75	78
PM	E	66	54	31	34	63	80	184



25 ROUTE 460 AT BLUE HILLS DRIVE/MEXICO WAY – SAFETY CONDITIONS

■ 32 crashes

- 20 (63%) angle crashes
 - 10 WBL / EBT
 - 5 EBL / WBT
- 10 (31%) rear end crashes
 - 6 EB crashes
 - 4 WB crashes



Crash Type

- Rear End
- △ Angle
- ✱ Pedestrian
- ◇ Head On



Sideswipe



Fixed Object



Deer/Other Animal



Other

Crash Severity



FATAL

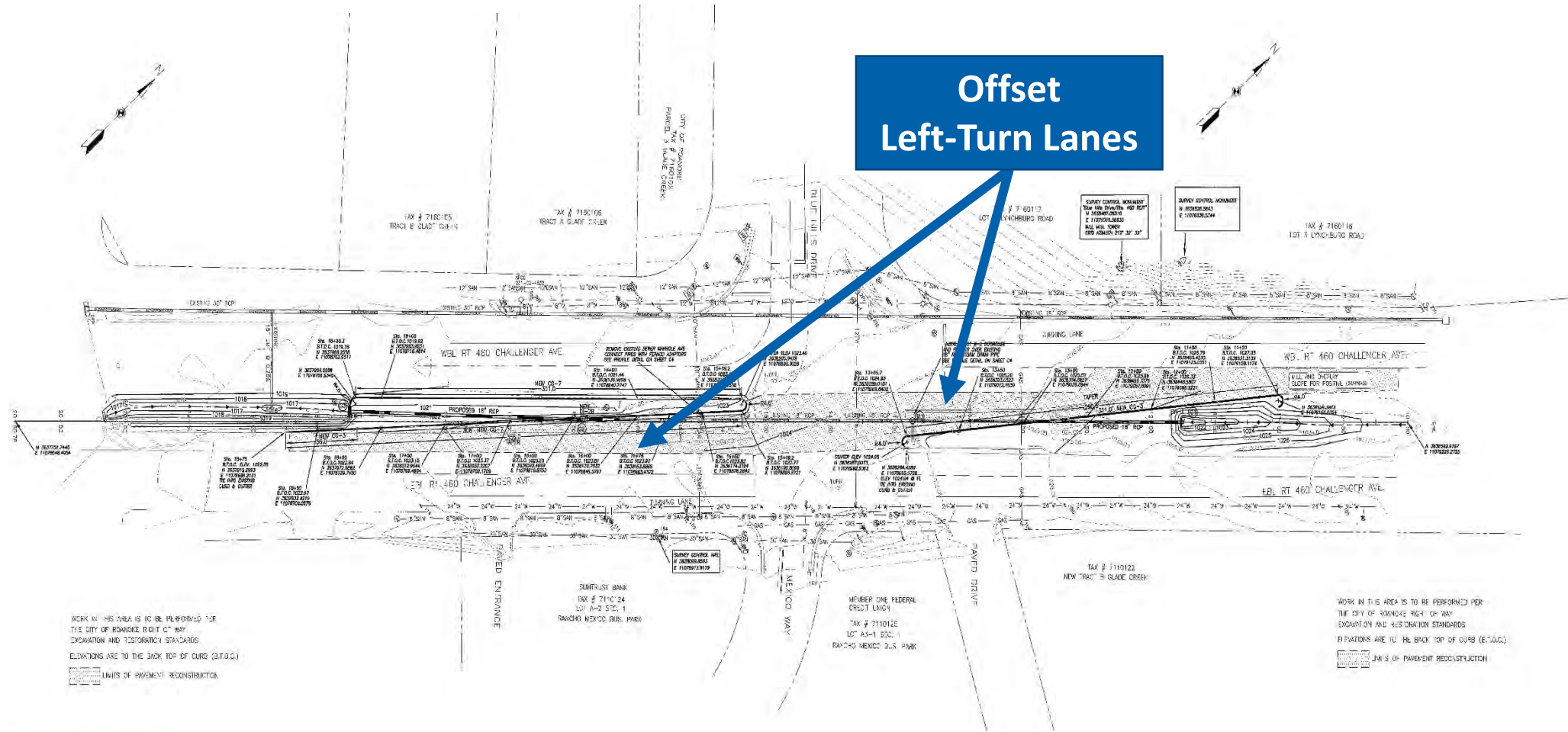


INJURY



PROPERTY DAMAGE ONLY

25 ROUTE 460 AT BLUE HILLS DRIVE/MEXICO WAY – SMART SCALE IMPROVEMENTS



25 ROUTE 460 AT BLUE HILLS DRIVE/MEXICO WAY – ALTERNATIVES CONSIDERED

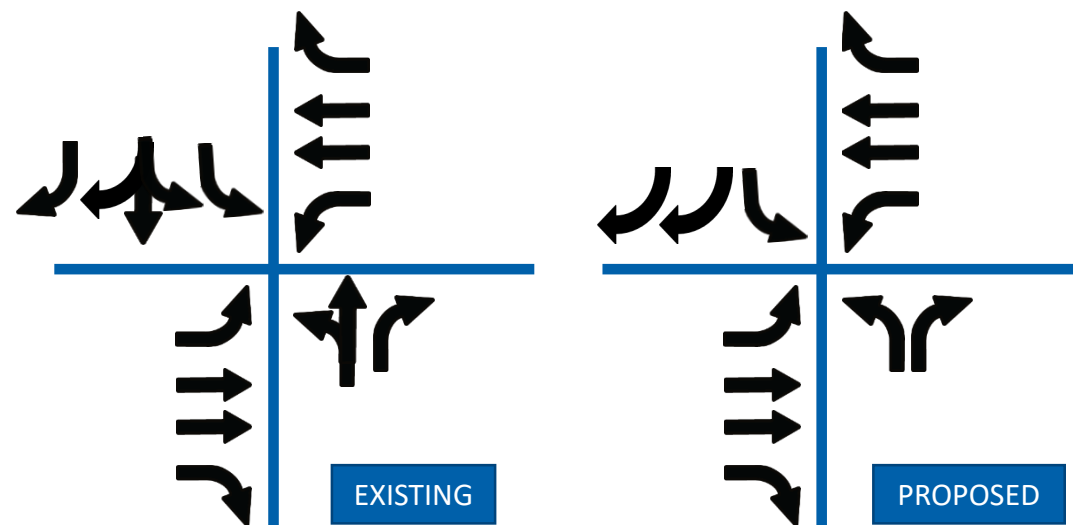
■ No Build Improvements (SMART SCALE)

- Offset the EB and WB left-turn lanes

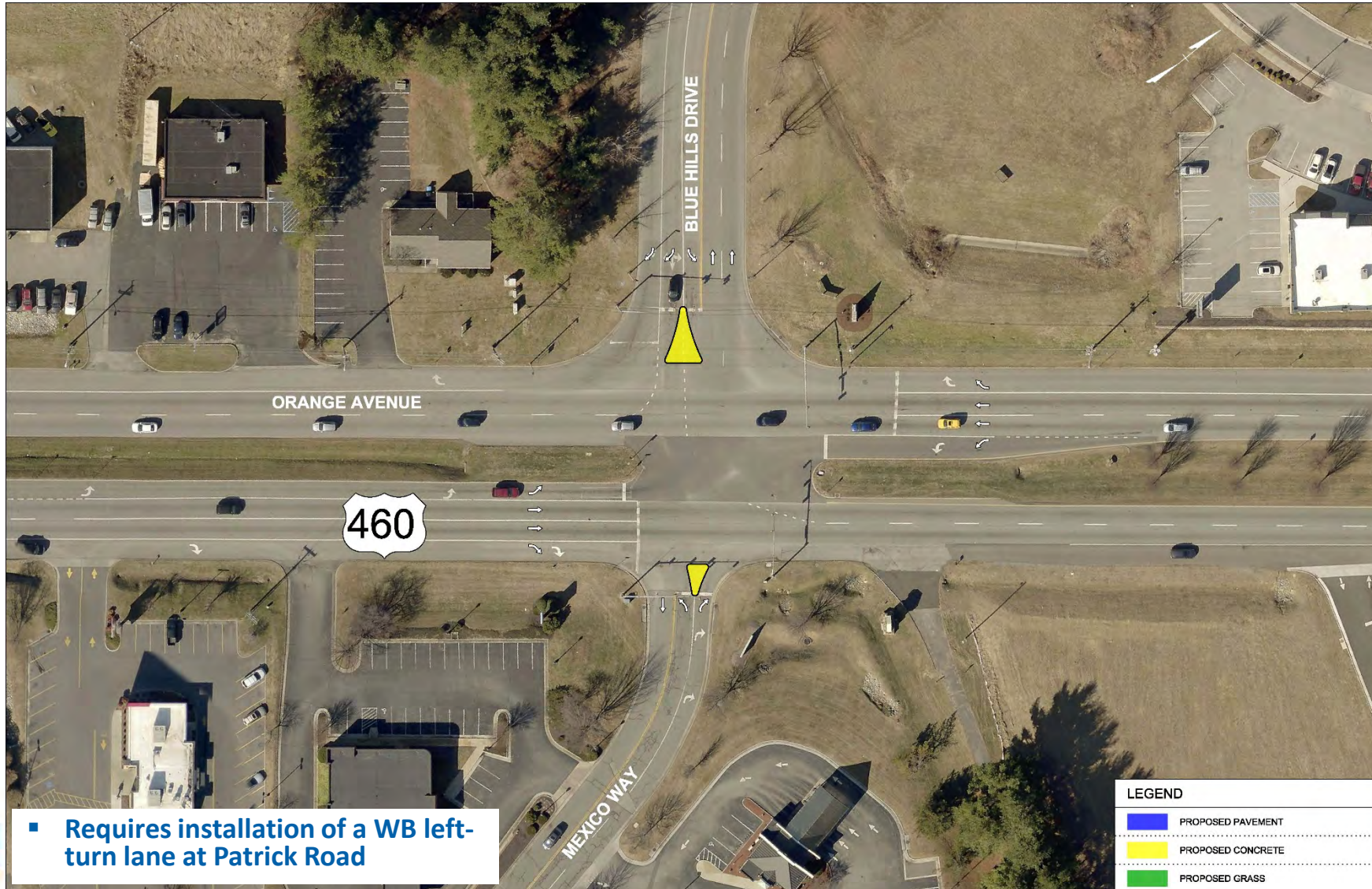
■ Alternatives Considered

- Thru-cut (prohibit NB and SB thru) (RECOMMENDED)
 - SB thru diverted to U-turn at Patrick Road or SB right turn from Blue Hills Village Drive (≤ 17 vph)
 - Install WB left-turn lane at Patrick Road
 - NB thru diverted to U-turn at Blue Hills Village Drive (≤ 11 vph)

Option	LOS		Delay (sec)		Notable Delay Improvements (sec)
	AM	PM	AM	PM	
No Build	D	E	36	66	--
Thru-Cut	C	C	24	32	AM: EBL: -52, WBT: -14, SBR: -17 PM: EBL: -15, EBT: -41, SBR: -102



25 ROUTE 460 AT BLUE HILLS DRIVE/MEXICO WAY – POTENTIAL IMPROVEMENTS

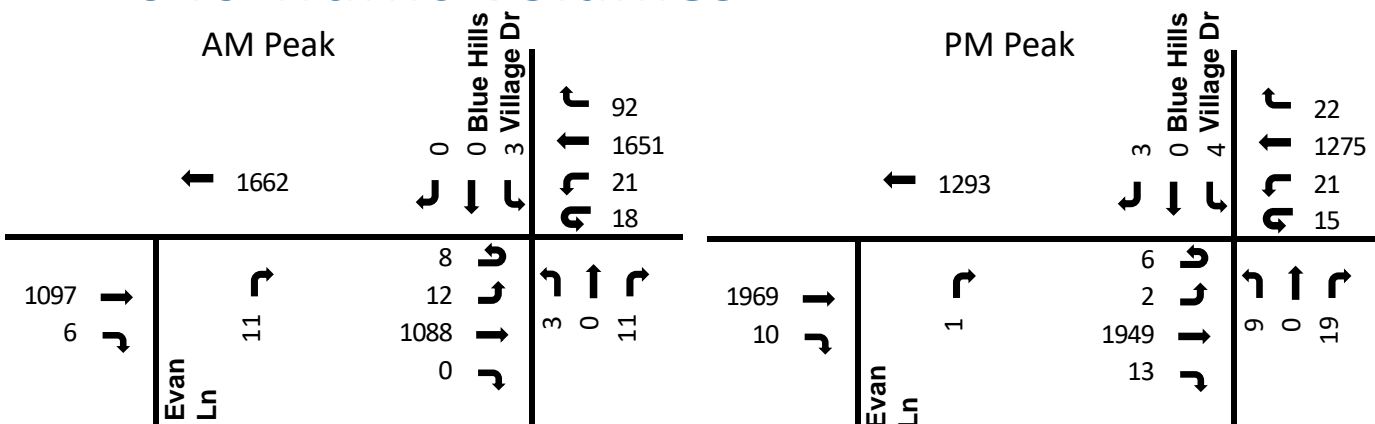


26

27

ROUTE 460 AT EVAN LANE AND BLUE HILLS VILLAGE DRIVE – TRAFFIC OPERATIONS

2040 Traffic Volumes



2040 No Build Traffic Operations

Route 460 at Blue Hills Village Drive				
Peak Hour	EBL	WBL	NB	SB
	Movement/Approach Delay (sec)			
AM	28	16	20	75
PM	20	45	47	36



ROUTE 460 AT EVAN LANE AND BLUE HILLS VILLAGE DRIVE – SAFETY CONDITIONS

26 Evan Lane - 0 crashes

27 Blue Hills Village Drive - 11 crashes

- 5 rear end crashes
- 6 angle crashes
 - 2 WBL / EBT
 - 1 SBT / EBR
 - 3 Undetermined



Crash Type

- Rear End
- △ Angle
- ✱ Pedestrian
- ◇ Head On



Sideswipe



Fixed Object



Deer/Other Animal



Other

Crash Severity



FATAL



INJURY



PROPERTY DAMAGE ONLY

ROUTE 460 AT EVAN LANE AND BLUE HILLS VILLAGE DRIVE – ALTERNATIVES CONSIDERED

26 Evan Lane

- No improvements

27 Blue Hills Village Drive

- RCUT (RECOMMENDED)
 - Minimal NB left turns (≤ 9 vph) during peak periods
 - NB left turns diverted to W. Ruritan Rd
 - Minimal SB left turns (≤ 4 vph) during peak periods
 - SB left turns diverted to Blue Hills Dr
- Close median opening

Intersection	Movement	Delay and Travel Time (min)			
		No Build		Build (Rerouted)	
		AM	PM	AM	PM
Blue Hills Village Dr	NBL	0.3	0.8	3.0	1.6
	SBL	1.2	0.6	1.5	1.6

26
27

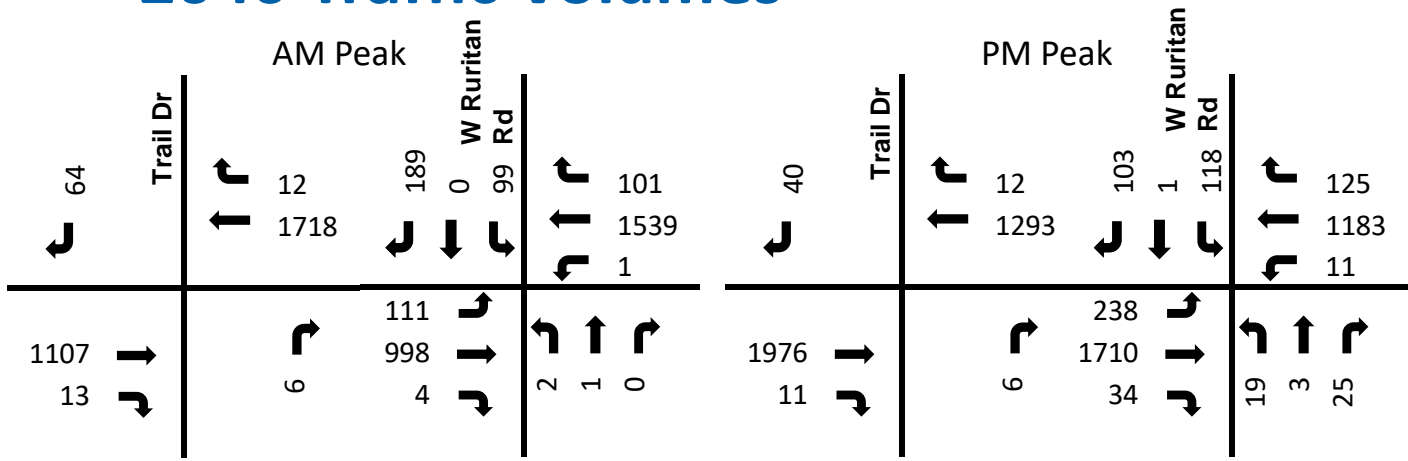
ROUTE 460 AT EVAN LANE AND BLUE HILLS VILLAGE DRIVE – POTENTIAL IMPROVEMENTS



28
29

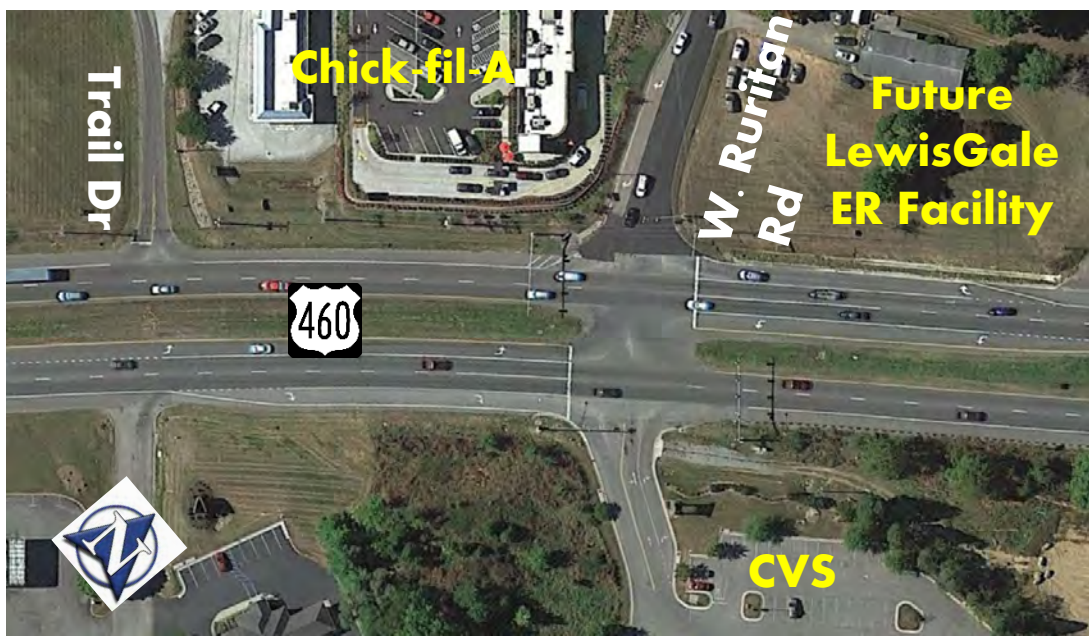
ROUTE 460 AT TRAIL DRIVE AND WEST RURITAN ROAD – TRAFFIC OPERATIONS

2040 Traffic Volumes



2040 No Build Traffic Operations

Peak Hour	Route 460 at West Ruritan Road							
	INT		EBT	WBT	EBL	WBL	NB	SB
	LOS	Delay	Movement/Approach Delay (sec)					
AM	C	26	16	21	62	8	175	78
PM	C	28	4	42	20	56	87	81



ROUTE 460 AT TRAIL DRIVE AND WEST RURITAN ROAD – SAFETY CONDITIONS

28 Trail Drive - 1 crash

- 1 rear end crash

29 West Ruritan Road - 81 crashes

- 63 (78%) rear end crashes
 - 34 EB crashes
 - 28 WB crashes
- 15 angle crashes
 - 7 EBL / WBT
 - 4 WBL / EBT



Crash Type

- Rear End
- △ Angle
- ✱ Pedestrian
- ◊ Head On



Sideswipe



Fixed Object



Deer/Other Animal



Other

Crash Severity



FATAL

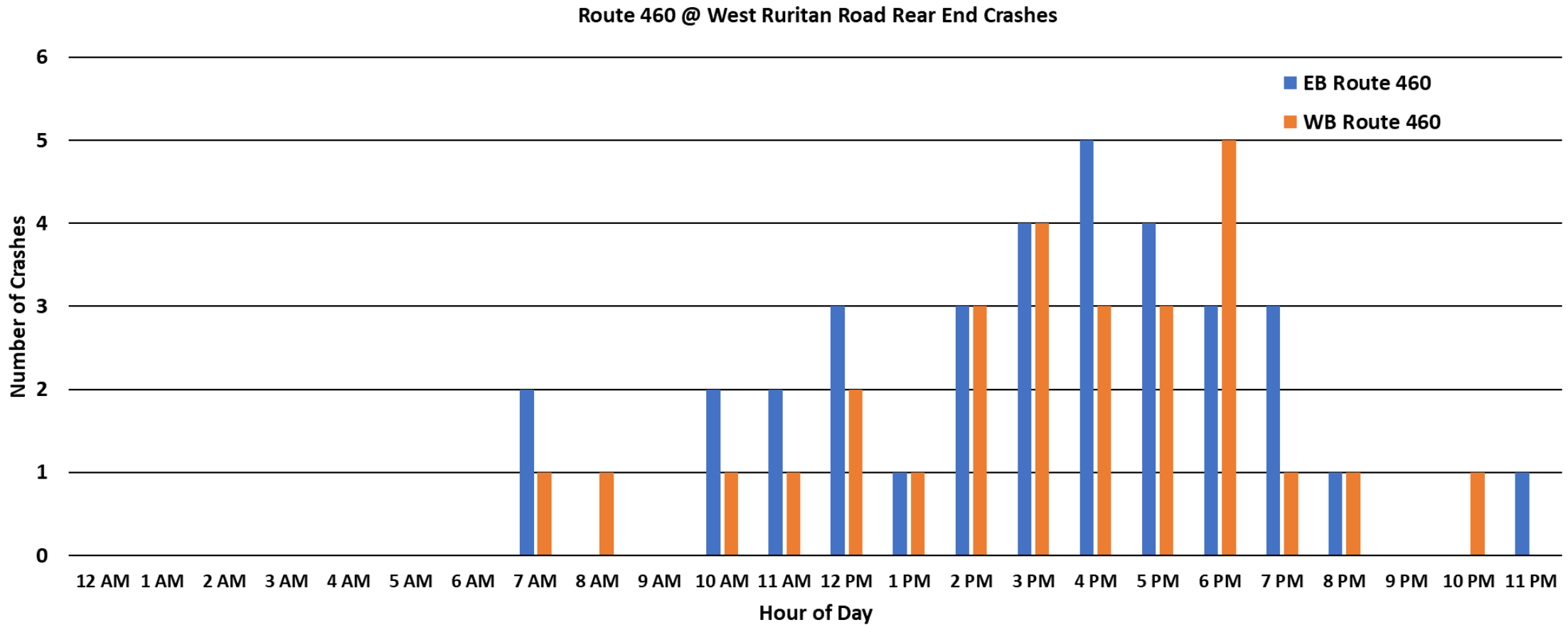


INJURY



PROPERTY DAMAGE ONLY

29 ROUTE 460 AT WEST RURITAN ROAD – SAFETY CONDITIONS



ROUTE 460 AT TRAIL DRIVE AND WEST RURITAN ROAD – ALTERNATIVES CONSIDERED

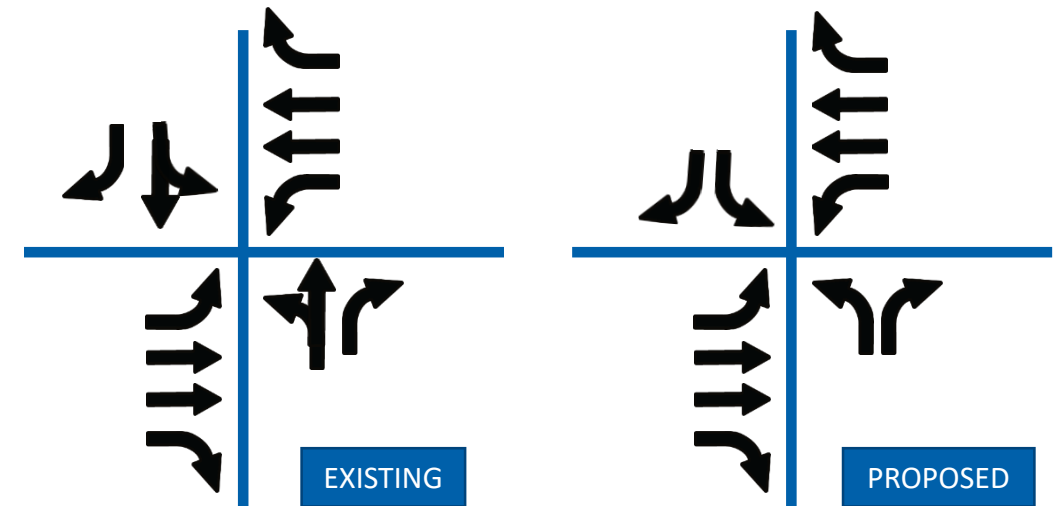
28 Trail Drive

- No improvements

29 West Ruritan Road

- Thru-cut (prohibit NB and SB thru) (RECOMMENDED)
 - SB thru diverted to U-turn at Blue Hills Village Dr (≤ 3 vph)
 - NB thru diverted to U-turn at Valley Gateway Blvd (≤ 5 vph)

Route 460 at West Ruritan Road					
Option	LOS		Delay (sec)		Notable Delay Improvements (sec)
	AM	PM	AM	PM	
No Build	C	C	26	28	--
Thru-Cut	C	B	21	15	AM: EBL: -15, WBT: -10 PM: WBT: -29, SBR: -6

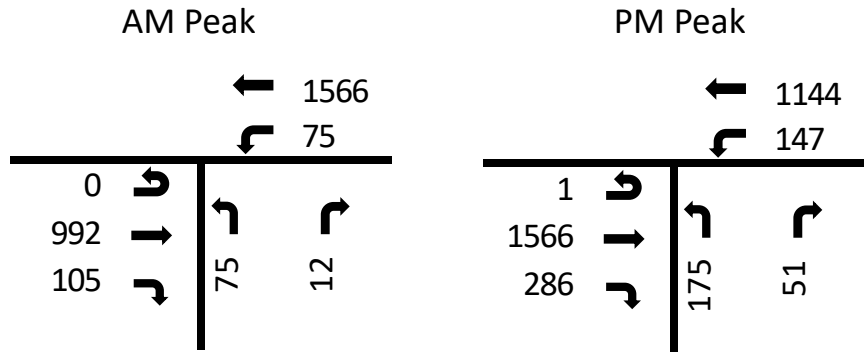


29 ROUTE 460 AT WEST RURITAN ROAD – POTENTIAL IMPROVEMENTS



30 ROUTE 460 AT VALLEY GATEWAY BOULEVARD – TRAFFIC OPERATIONS

2040 Traffic Volumes



2040 No Build Traffic Operations

Peak Hour	INT		EBT	WBT	EBL	WBL	NB
	LOS	Delay	Movement/Approach Delay (sec)				
AM	A	9	7	2	0	94	68
PM	C	23	17	12	131	89	72



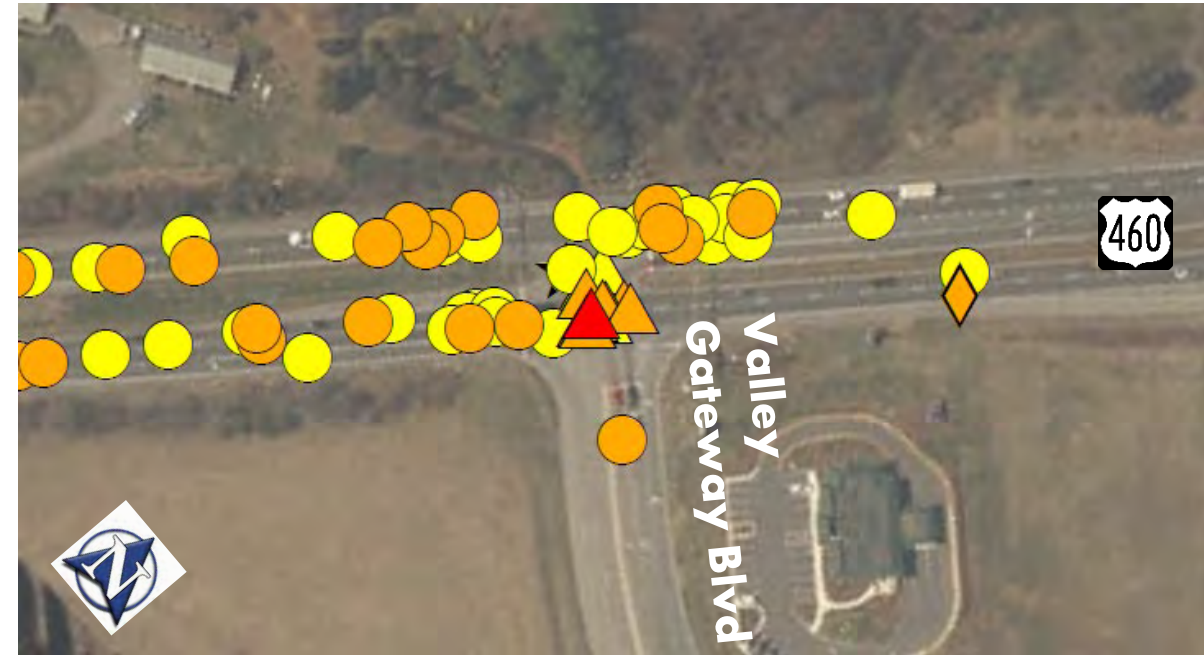
30 ROUTE 460 AT VALLEY GATEWAY BOULEVARD – SAFETY CONDITIONS

■ 69 crashes

- 55 (80%) rear end crashes
 - 26 EB crashes
 - 27 WB crashes
- 12 angle crashes

■ Recommendation

- No proposed improvements
 - Intersection operates at LOS A/C
 - Recent signal timing improvements and coordination along Route 460 will reduce potential for rear end crashes



Crash Type

- Rear End
- △ Angle
- ⊛ Pedestrian
- ◇ Head On

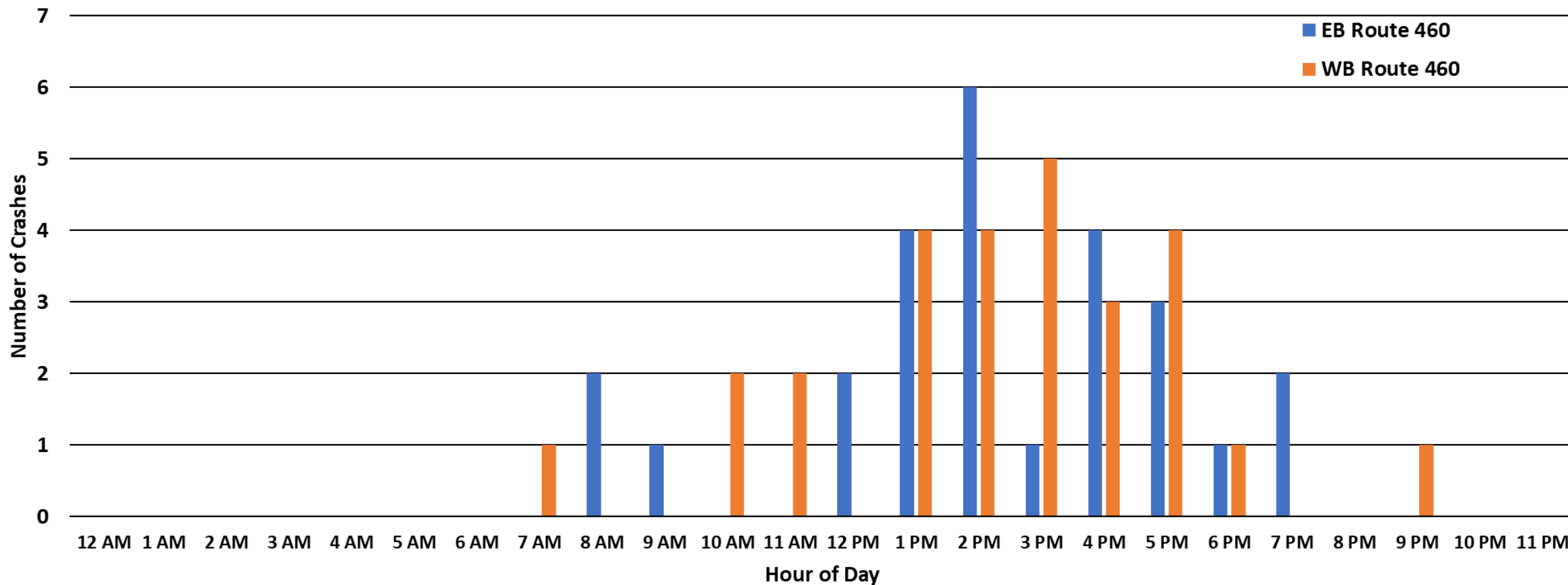
- ☆ Sideswipe
- Fixed Object
- ◇ Deer/Other Animal
- ⊕ Other

Crash Severity

- FATAL
- INJURY
- PROPERTY DAMAGE ONLY

30 ROUTE 460 AT VALLEY GATEWAY BOULEVARD – SAFETY CONDITIONS

Route 460 @ Valley Gateway Blvd Rear End Crashes

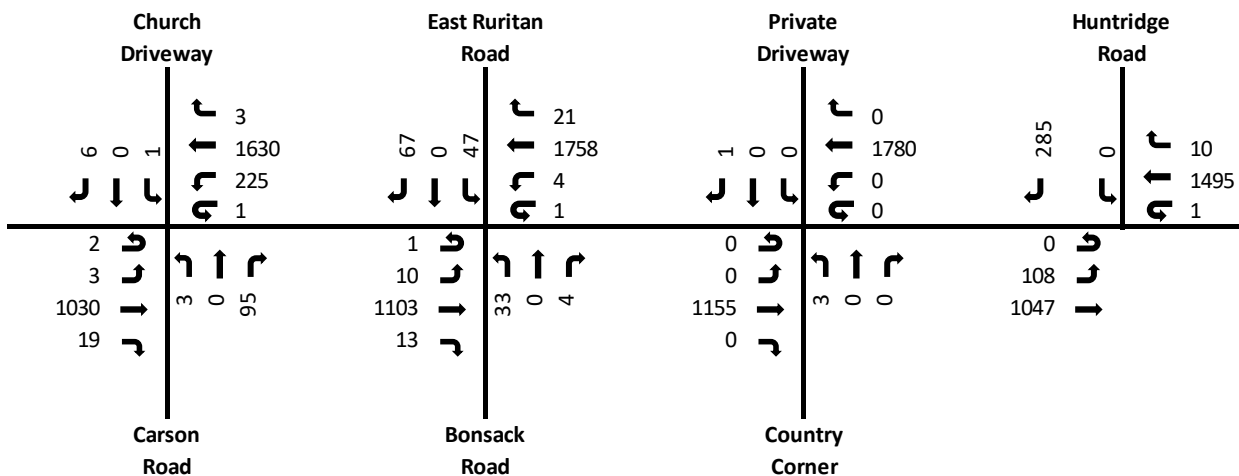


31 33
32 34

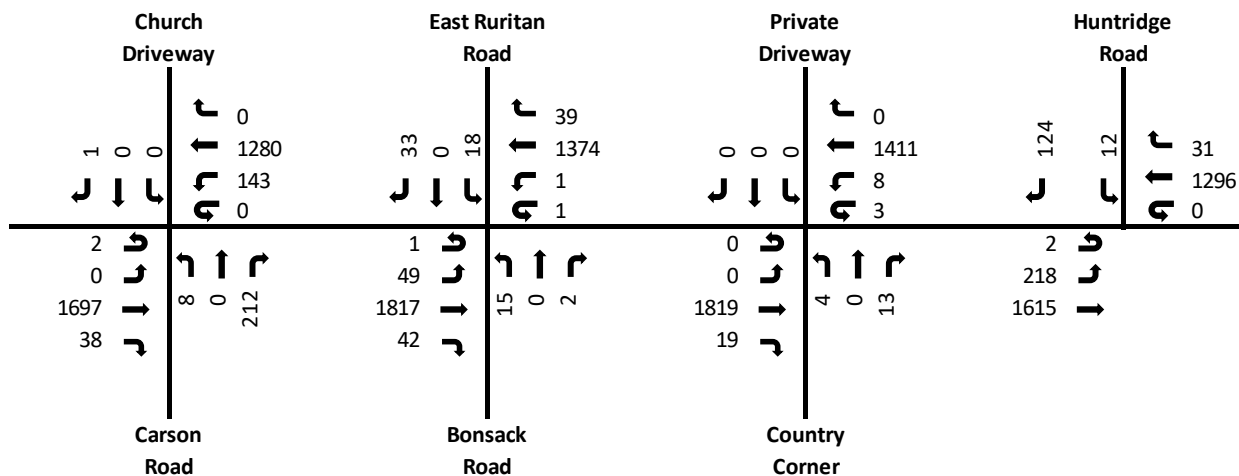
ROUTE 460 AT CARSON ROAD TO HUNTRIDGE ROAD – TRAFFIC OPERATIONS

2040 Traffic Volumes

AM Peak



PM Peak



ROUTE 460 AT CARSON ROAD TO HUNTRIDGE ROAD – SAFETY CONDITIONS

31 Carson Road - 8 crashes

- 2 angle crashes
 - 2 EBT / NBL
- 2 fixed object crashes

32 East Ruritan Road - 13 crashes

- 7 angle crashes
 - 1 EBT / NBT
 - 1 EBL / WBT
 - 2 SBT / WBT

33 Median Opening East of East Ruritan Road – 13 crashes

- 5 rear end crashes
- 5 angle crashes
 - 4 EBT / NBT
 - 1 EBT / NBL

34 Huntridge Road – 15 crashes

- 5 rear end crashes
- 5 deer crashes
- 4 angle crashes
 - 2 SBL / WBT
 - 1 SBR / WBT
 - 1 SBL / EBT

Crash Type

○	Rear End	☆	Sideswipe
△	Angle	□	Fixed Object
⊙	Pedestrian	◇	Deer/Other Animal
⬡	Head On	⊕	Other

Crash Severity

■	FATAL
■	INJURY
■	PROPERTY DAMAGE ONLY



ROUTE 460 AT CARSON ROAD TO HUNTRIDGE ROAD – ALTERNATIVES CONSIDERED

31 Carson Road

- RCUT
 - Minimal NB left turn/thru (≤ 8 vph) and SB left turn/thru (≤ 1 vph) during peak periods
 - NB and SB left turns diverted to U-turns at E Ruritan Rd/Bonsack Rd and Valley Gateway Blvd

32 East Ruritan Road

- Seagull; prohibit NB left turn and through and WB left turn
 - ≤ 33 NB left turn/thru during peak periods
 - NB left turns diverted to make U-turns at median opening to the east or to the Bonsack Rd intersection east of Route 220 ALT
 - Minimal WB left turn (≤ 4 vph) during peak periods diverted to Bonsack Rd intersection east of Route 220 ALT

33 Median Opening East of East Ruritan Road

- RCUT
 - Minimal NB left turn/thru (≤ 4 vph) during peak periods
 - NB left turns diverted to U-turns at Huntridge Rd

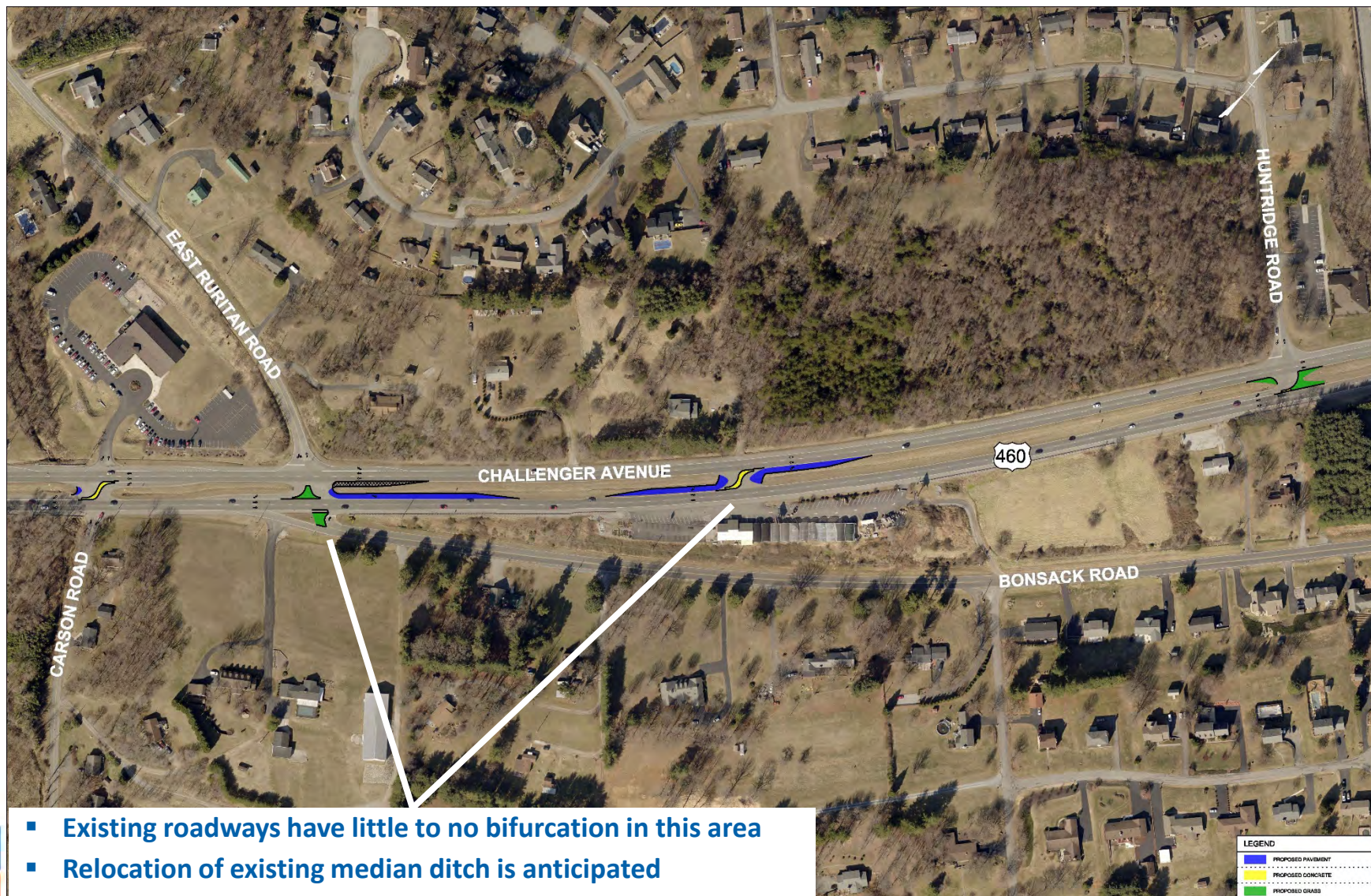
34 Huntridge Road

- Accommodate EB left-turn only
 - Minimal SB left (≤ 12 vph) during peak periods
 - SB left turns diverted to U-turns at median opening to the west or Route 220 ALT

Intersection	Movement	Delay and Travel Time (min)			
		No Build		Build (Rerouted)	
		AM	PM	AM	PM
Carson Rd	NBL	0.3	1.4	1.1	1.4
	SBL	0.7	0.1	4.6	3.3
E Ruritan Rd	NBL	1.5	1.9	2.1	1.3
Median opening east of E Ruritan Rd	NBL	0.7	0.6	1.7	1.4
Huntridge Rd	SBL	1.5	0.6	2.6	1.6

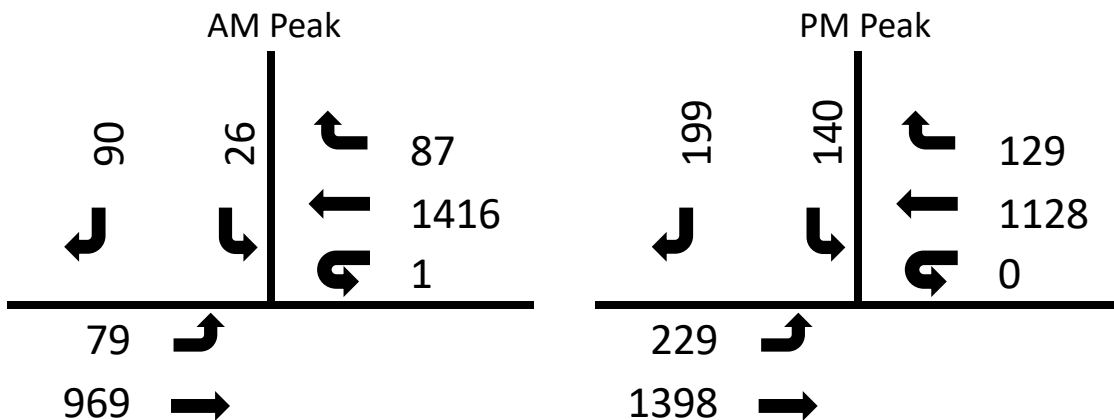
31 33 ROUTE 460 AT CARSON ROAD TO HUNTRIDGE ROAD – POTENTIAL IMPROVEMENTS

32 34



35 ROUTE 460 AT WALMART / LOWES ENTRANCE – TRAFFIC OPERATIONS

2040 Traffic Volumes



2040 No Build Traffic Operations

Peak Hour	INT		EBT	WBT	EBL	WBU
	LOS	Delay	Movement/Approach Delay (sec)			
AM	A	10	3	5	82	99
PM	B	17	3	11	60	N/A



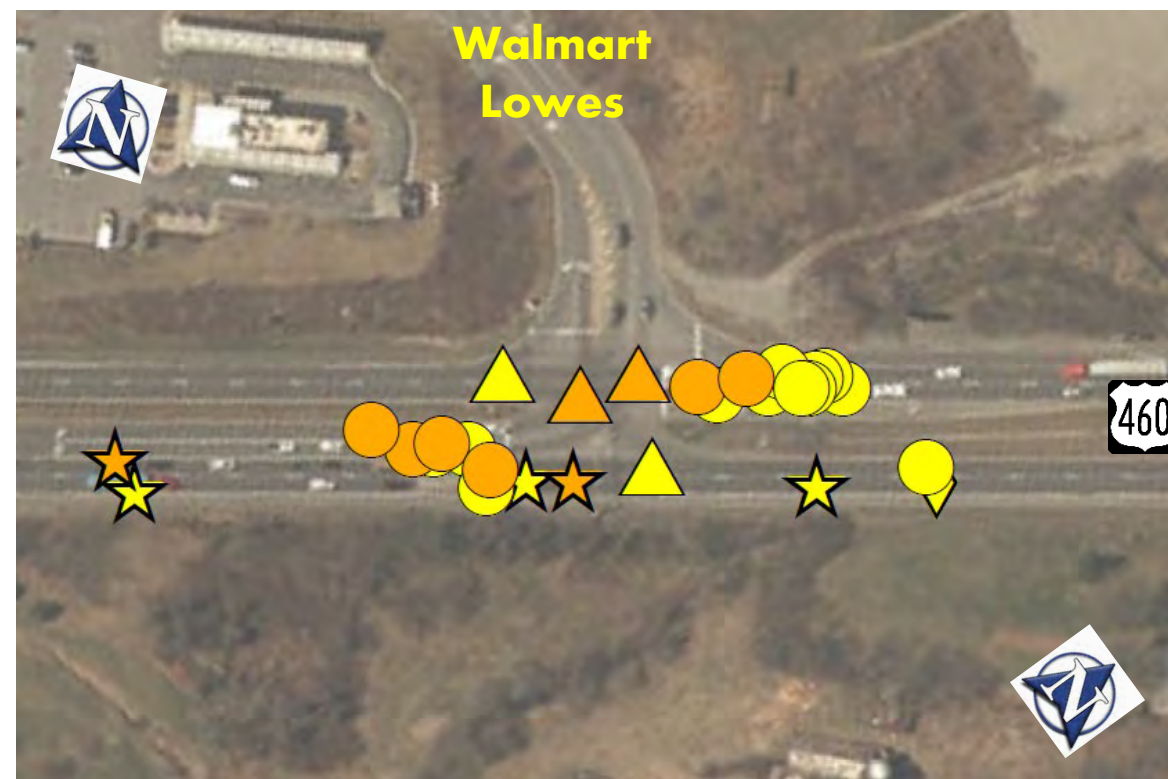
35 ROUTE 460 AT WALMART / LOWES ENTRANCE – SAFETY CONDITIONS

■ 27 crashes

- 18 (67%) rear end crashes
 - 9 EB crashes
 - 9 WB crashes
- 5 sideswipe crashes
- 4 angle crashes

■ Recommendation

- No proposed improvements
 - Intersection operates at LOS A/B



Crash Type

- Rear End
- △ Angle
- ✱ Pedestrian
- ◇ Head On



Sideswipe



Fixed Object



Deer/Other Animal



Other

Crash Severity



FATAL



INJURY



PROPERTY DAMAGE ONLY

36 ROUTE 460 AT ROUTE 220 ALT – ALTERNATIVES UNDER CONSIDERATION

- Displaced Left Turn proposed as part of Route 220 ALT Study



STARS

STRATEGICALLY TARGETED AND
AFFORDABLE ROADWAY SOLUTIONS

ROUTE 460 OPERATIONAL IMPROVEMENTS STUDY

Thank you.

