GORRILL PALMER

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Engineer's Recommendation
Intersection of Gray Road & Range Road
Cumberland, Maine

Date: August 16, 2023
Subject: Intersection Evaluation and Recommendations
Gray Road & Range Road
To: Bill Shane, P.E., Cumberland Town Manager
From: Randy Dunton, PE, PTOE – Gorrill Palmer

Introduction

The unsignalized intersection of Gray Road & Range Road has a history of increasing crashes over the last five years with a significant increase in the % injury. Currently, Range Road is 35 mph and is stop controlled with Gray Road being 50 mph and free flow conditions. MaineDOT has completed a very thorough review of the intersection including the potential impacts of converting the intersection from a two-way stopped controlled intersection to an all-way stop controlled intersection. This conversion includes; stop bars, additional signs (some with flags and some with LED lighting), and pavement markings.

Recommendation

Based on a review of the information provided by MaineDOT (see attached "Cumberland – Intersection of Gray Road & Range Road, Background Safety / Mobility Analysis", dated July 6, 2023), and discussions with their safety office as well as the Region Traffic Engineer, I concur with the MaineDOT's recommendation that the intersection be converted from a two-way stop controlled intersection to an all-way stop controlled intersection as identified in the attached power point.

Attachments

Attachment A – MaineDOT power point presentation: "Cumberland – Intersection of Gray Road & Range Road, Background Safety / Mobility Analysis", dated July 6, 2023

u:\3656.19_range @ route 100_cumberland\engineers recommendation 8-16-23.docx

Attachment A

MaineDOT Power Point

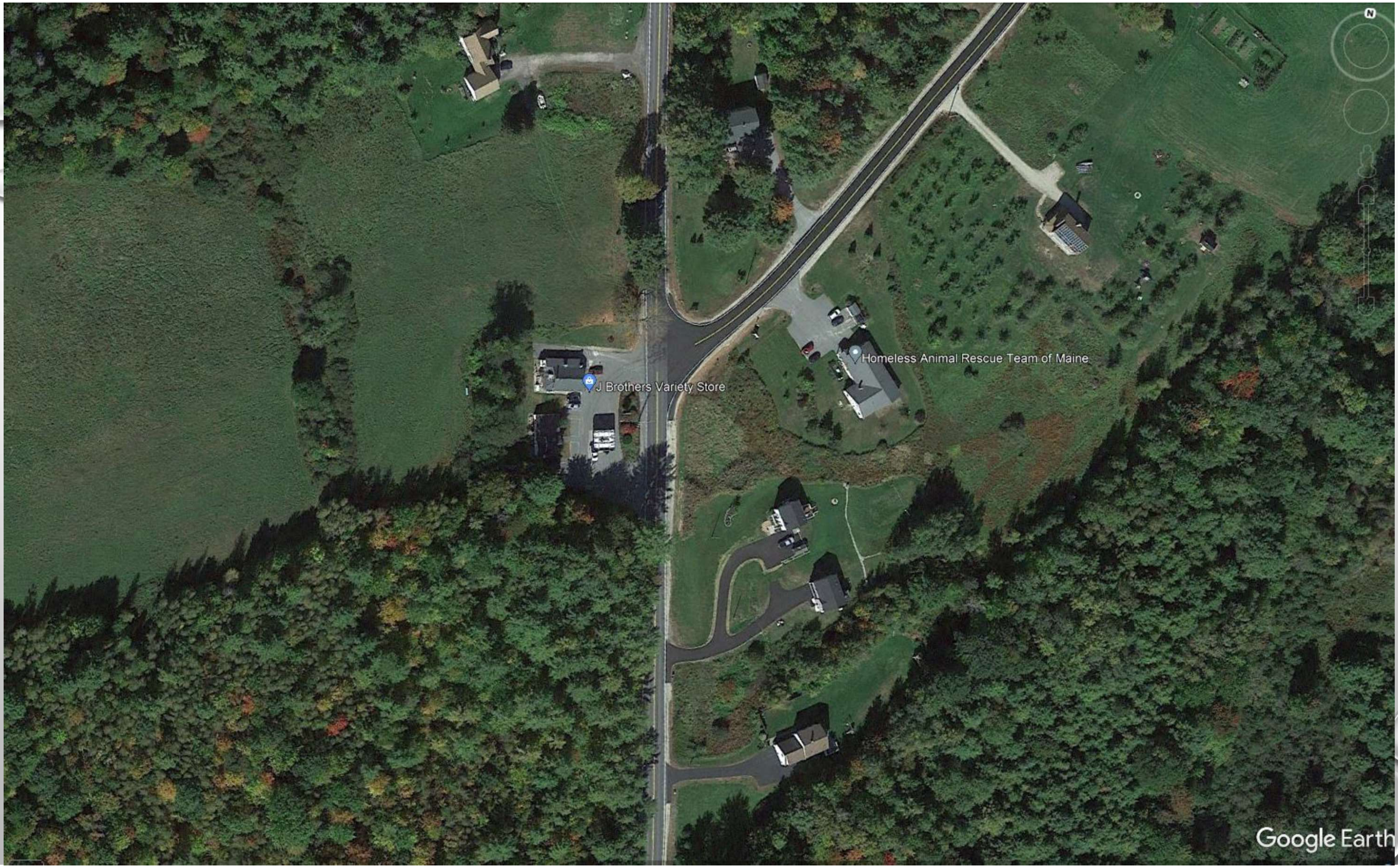
Cumberland – Intersection of Gray Road & Range Road

Background Safety/Mobility Analysis

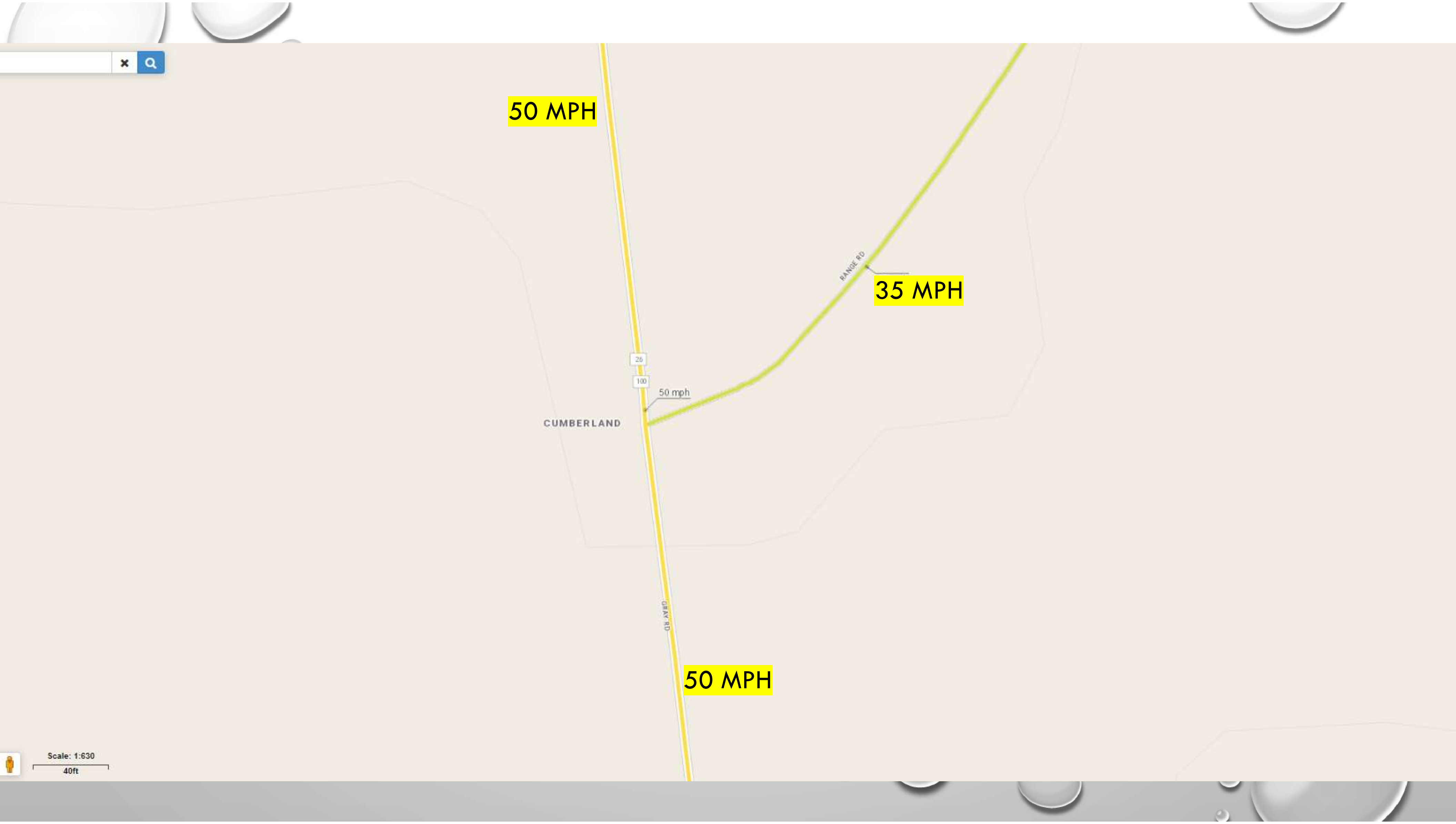
July 6, 2023

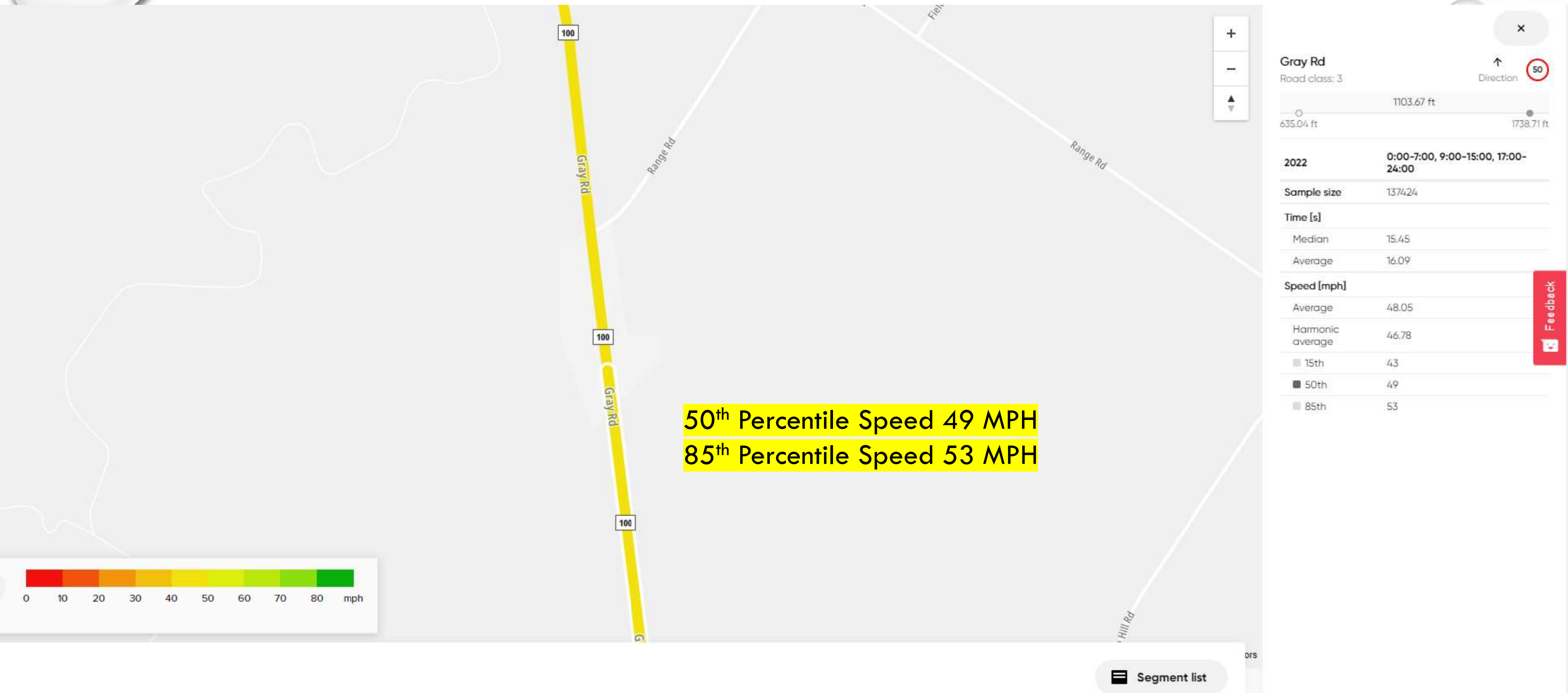
SAFETY PROBLEMS

- TYPES OF CRASHES
- SEVERITY OF CRASHES
- SIGHT DISTANCE
- ? (HAVEN'T BEEN ON FIELD VISIT YET 6-26-23)


J Brothers Variety Store
Homeless Animal Rescue Team of Maine
Google Earth


SUNOCO


50 MPH
35 MPH
RANGE RD
50 mph
CUMBERLAND
GRAY RD
50 MPH
Scale: 1:630
40ft

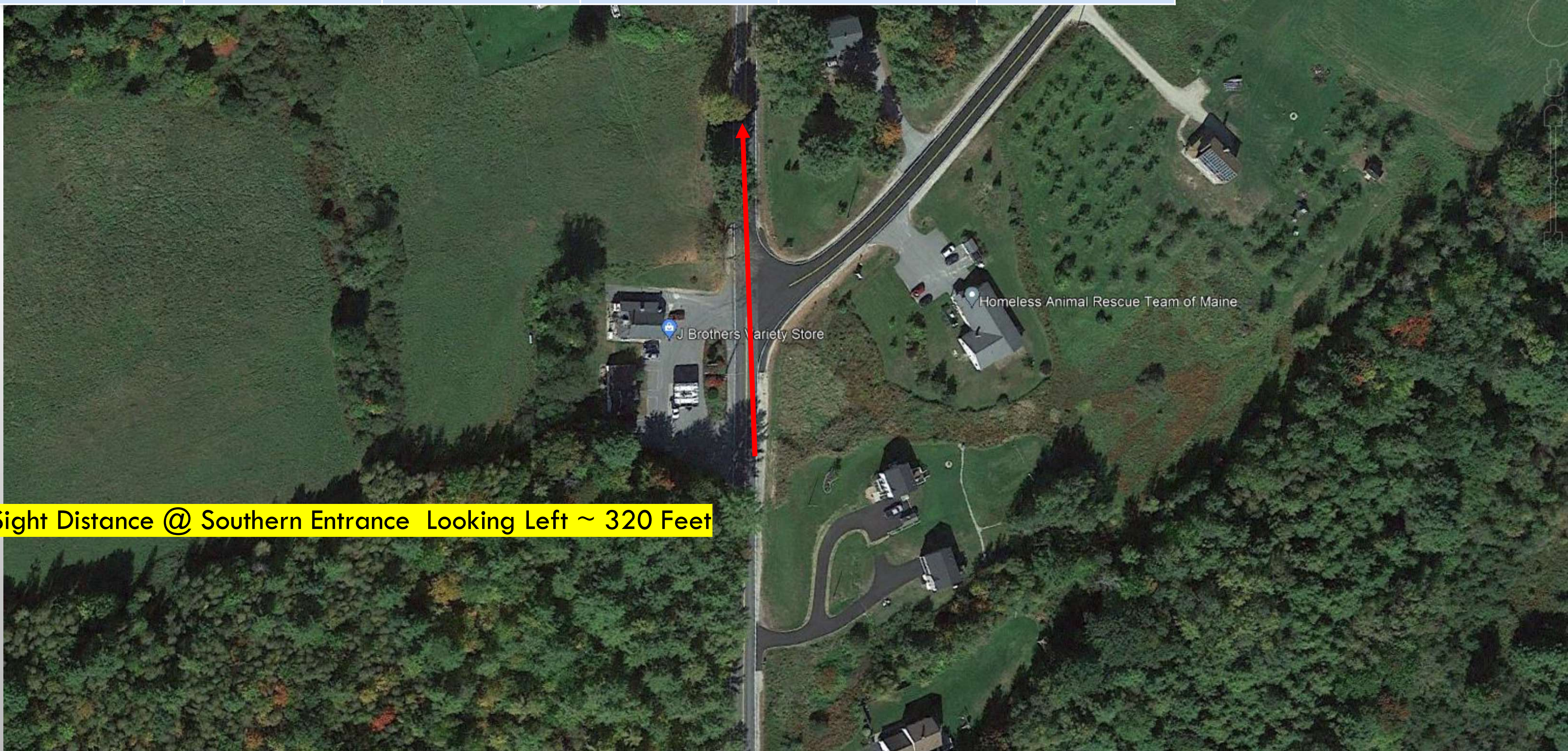


50th Percentile Speed 49 MPH

85th Percentile Speed 53 MPH

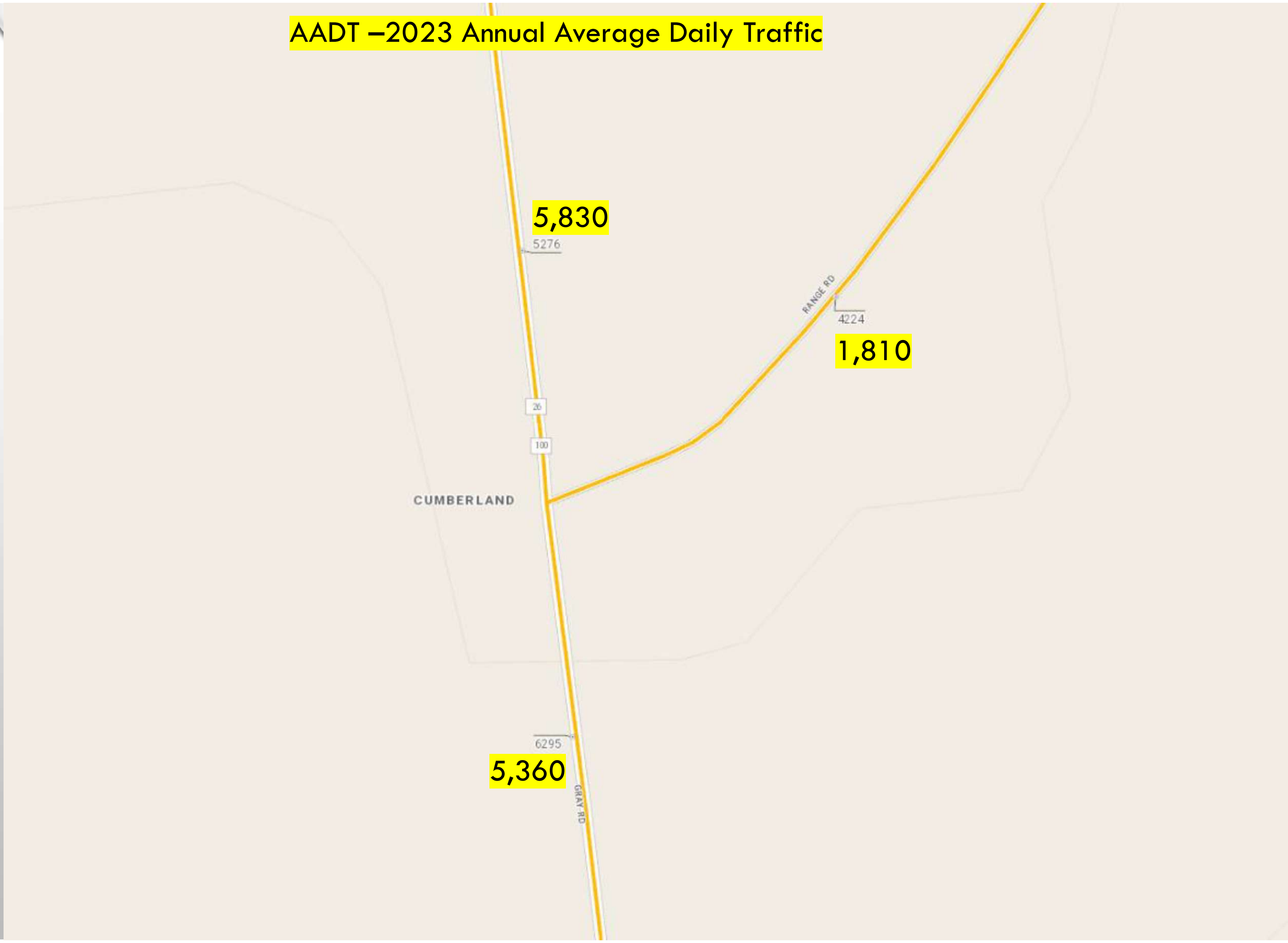
https://ts.tomtom.com/reports/share/details/CTT/3346743?t=1b01048d-233c-4bf5-8ef8-92ca11279a4c

Design Speed	35	40	45	50	55
Sight Distance	390	445	500	555	610



Sight Distance @ Southern Entrance Looking Left ~ 320 Feet

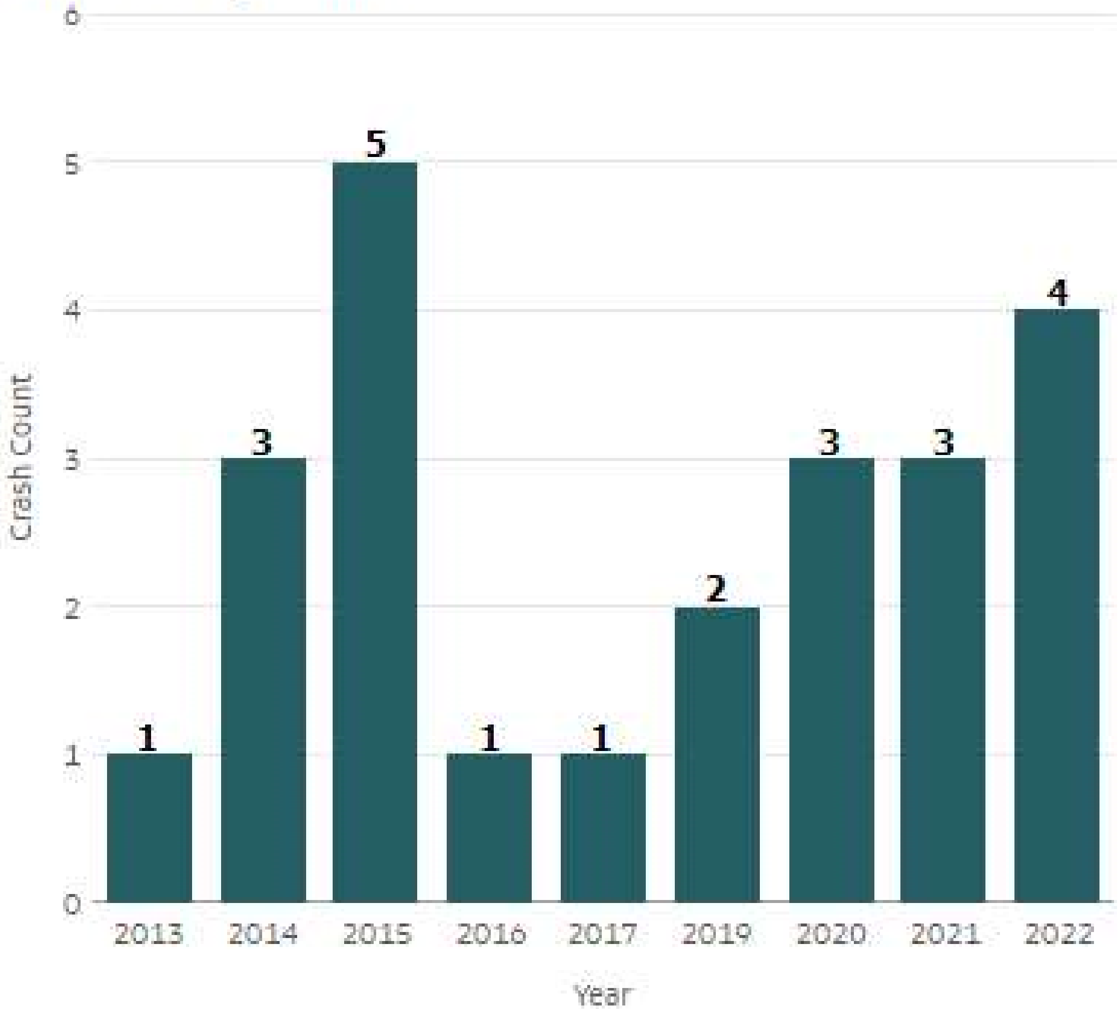
AADT –2023 Annual Average Daily Traffic



AM Peak Hour 7:15 to 8:15

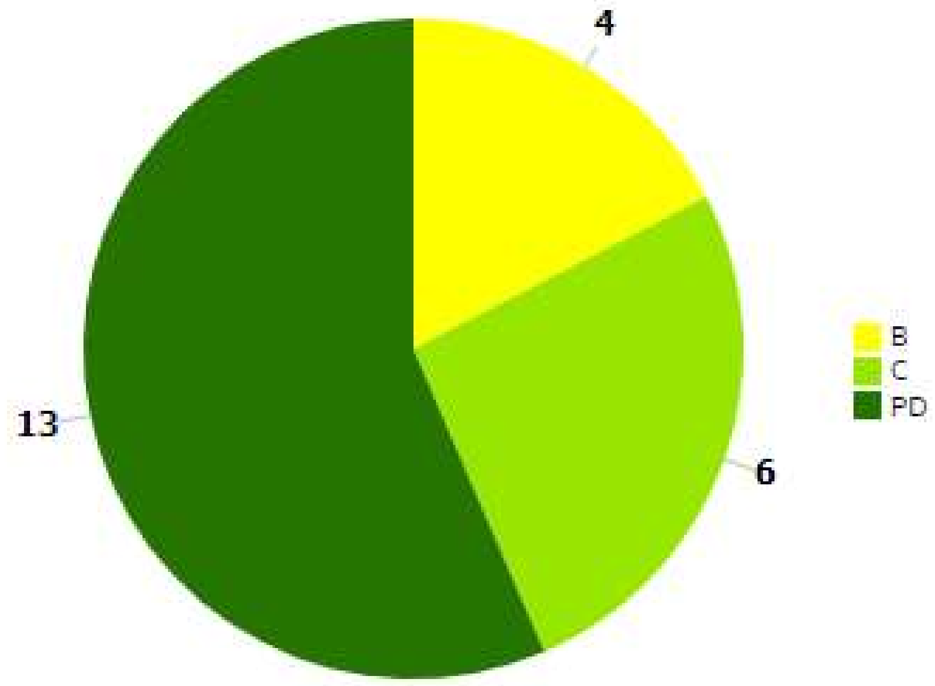

PM Peak Hour 4:30 to 5:30
No Intersection Selected
Piscataqua River
Range Rd
Store
91
15
32
30
169
9
6
288
32
9
5
4

Crashes By Year

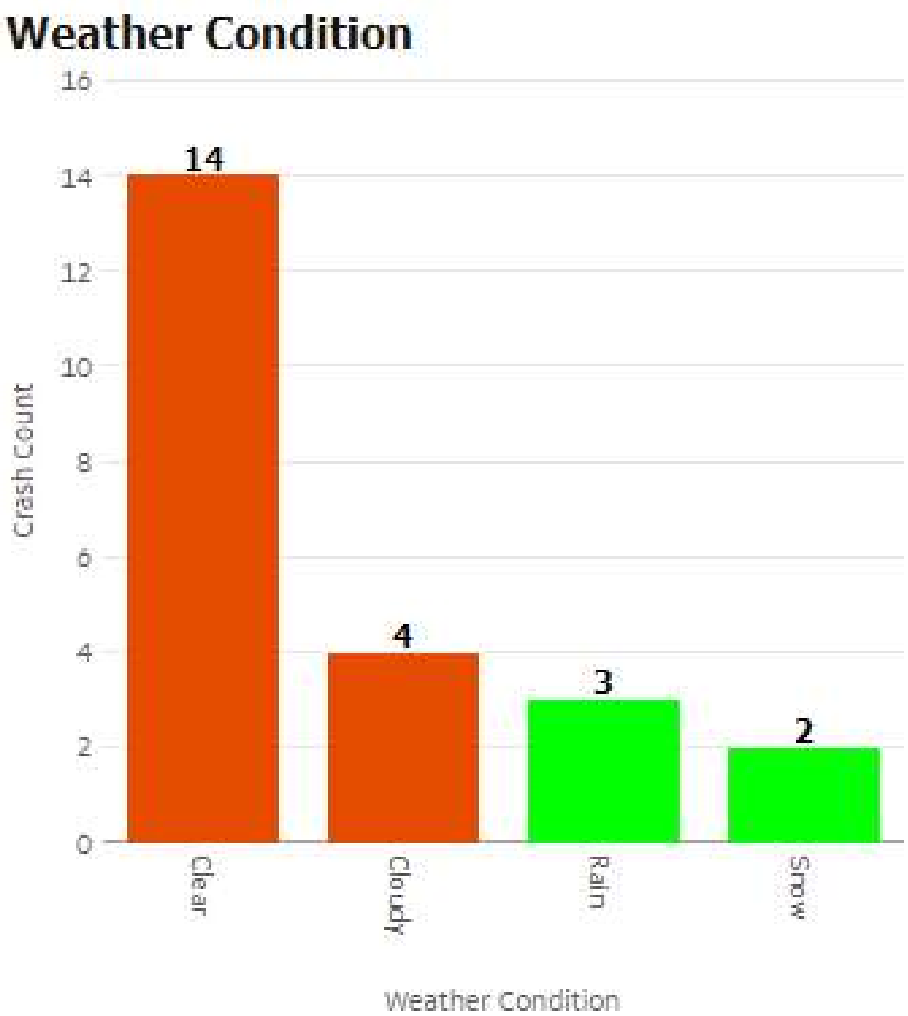


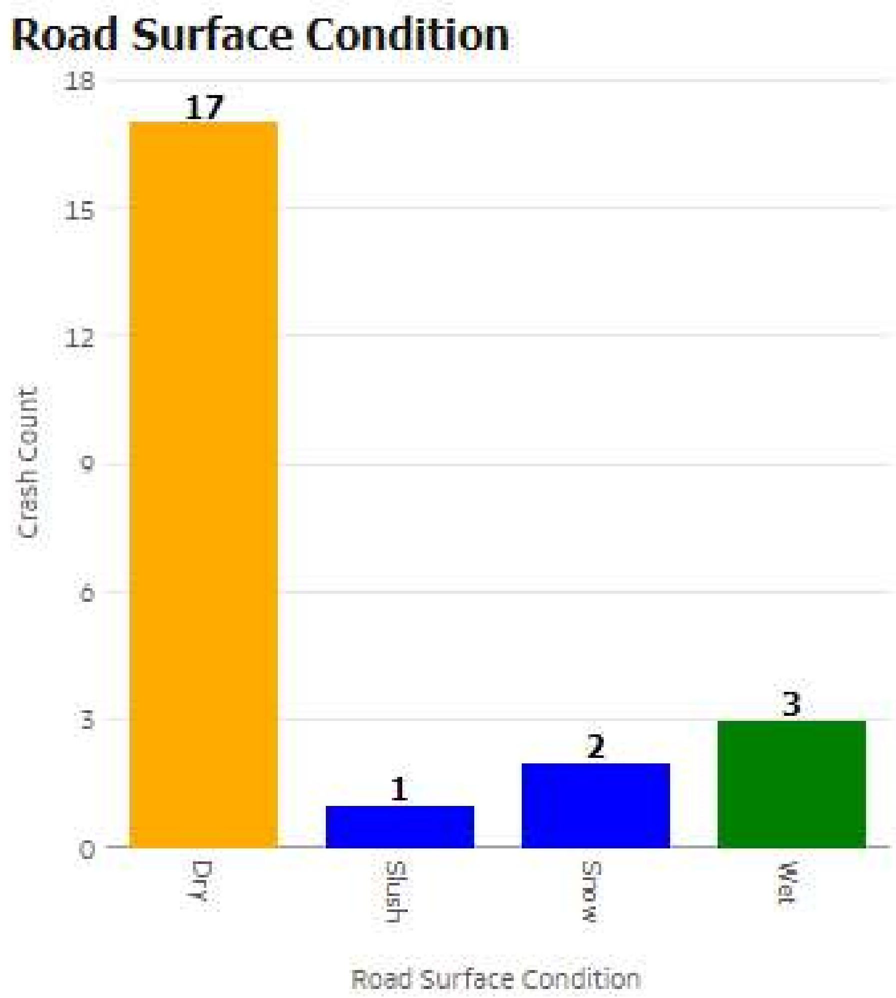
Year	Injury Crash Count	% Injury	B	C	PD	Number of Crashes
2013	0	0.00%			1	1
2014	1	33.33%		1	2	3
2015	2	40.00%		2	3	5
2016	0	0.00%			1	1
2017	0	0.00%			1	1
2019	0	0.00%			2	2
2020	2	66.67%	1	1	1	3
2021	2	66.67%	1	1	1	3
2022	3	75.00%	2	1	1	4
		Crash Count	**4**	**6**	**13**	**23**

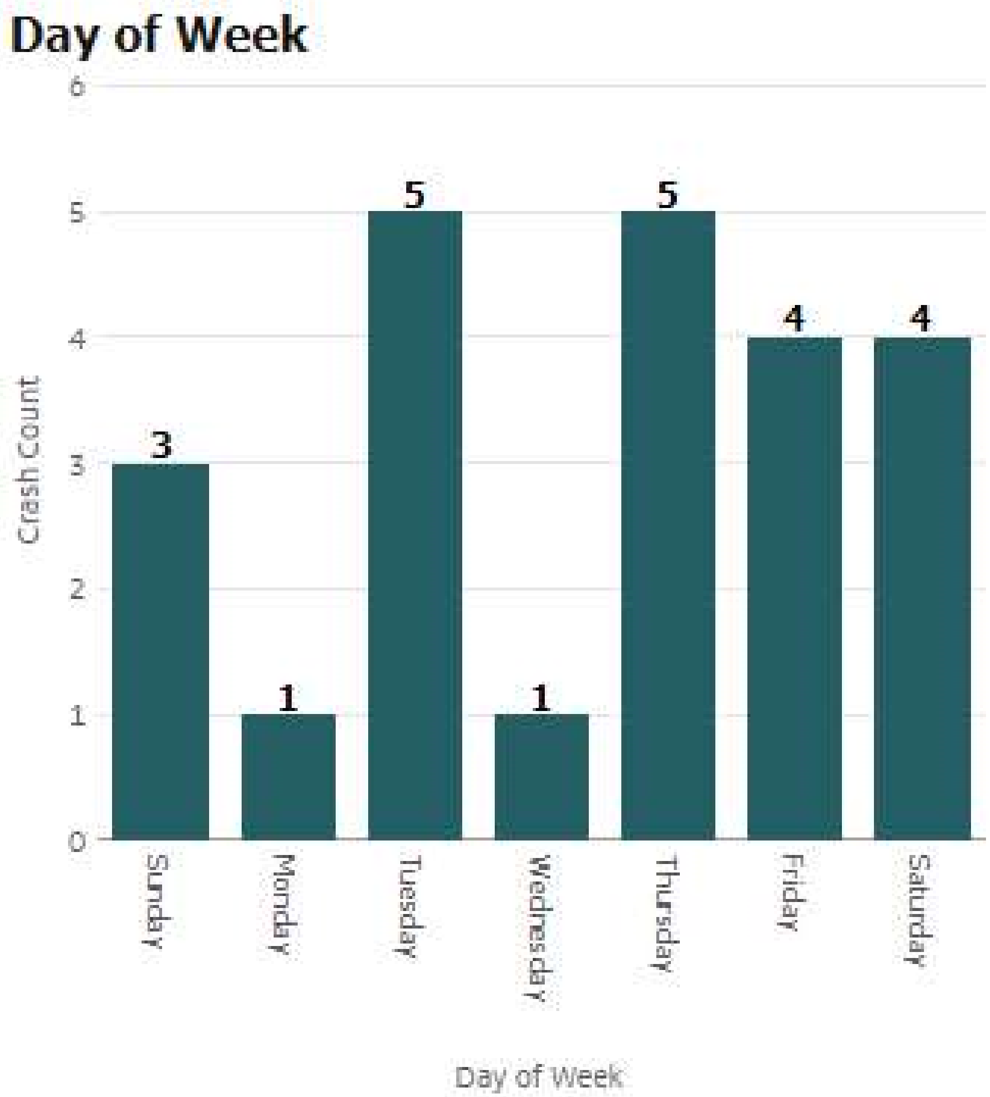
Injury Level

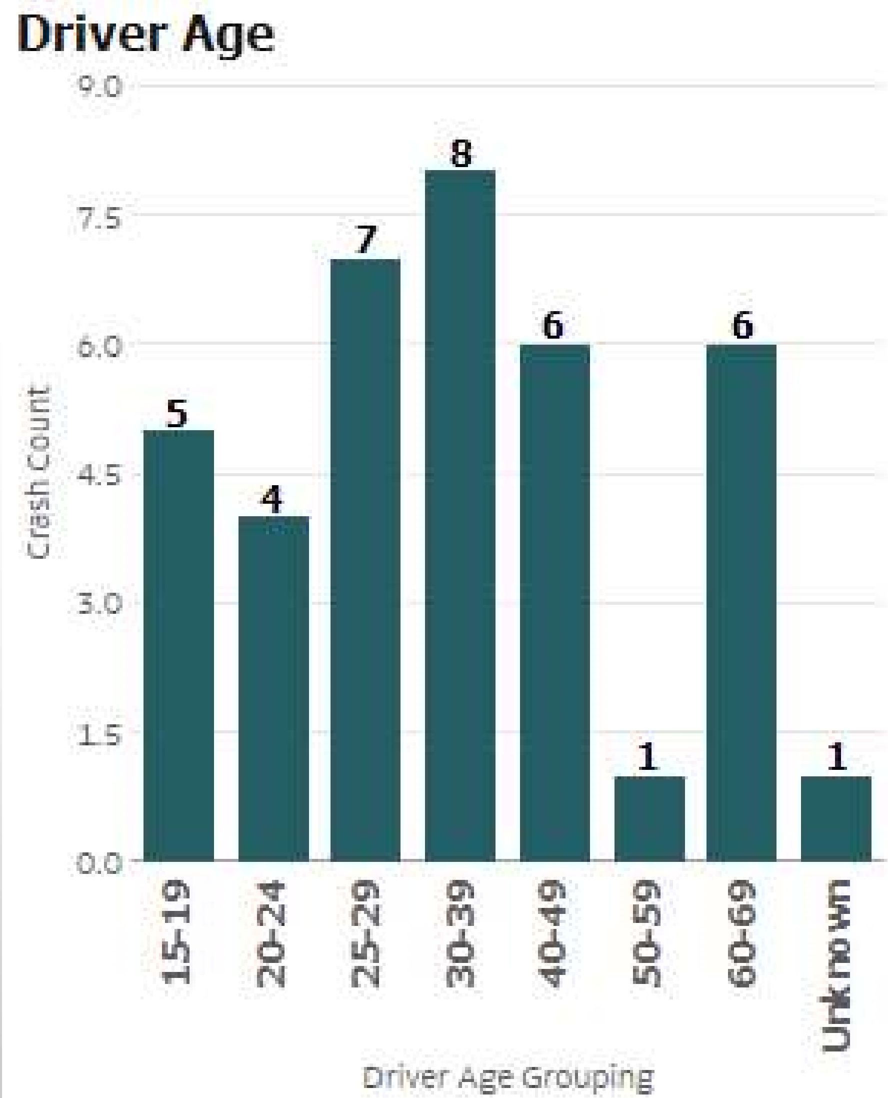


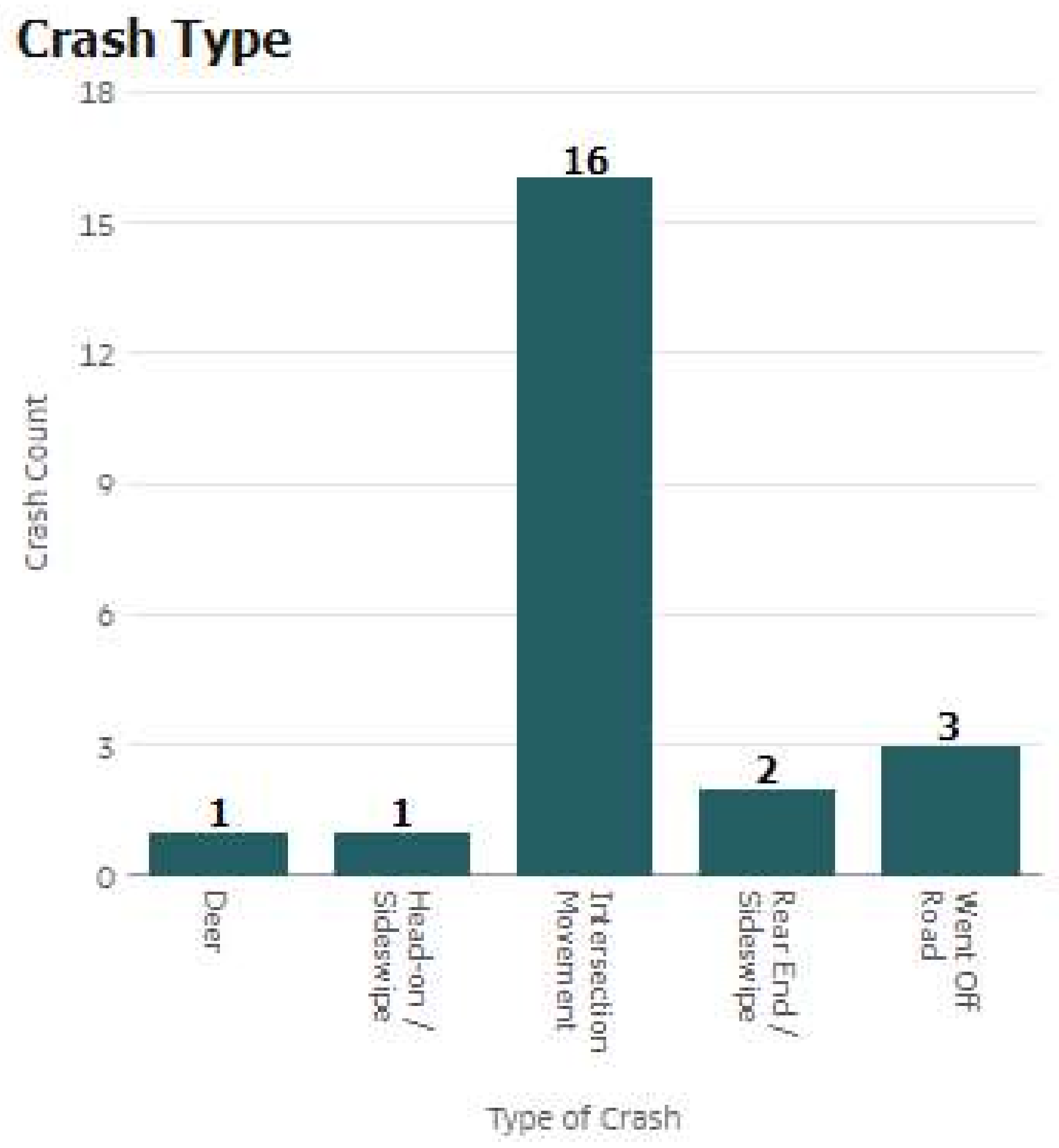
Route - MP	Section Length	U/R	Total Crashes	K	Injury Crashes A	B	C	PD	Percent Injury
Grand Totals:	0.03		23	0	0	4	6	13	43.5


Weather Condition
16
14
12
10
8
6
4
2
0
Crash Count
14
4
3
2
Clear
Cloudy
Rain
Snow
Weather Condition


Road Surface Condition
18
15
12
9
6
3
0
Crash Count
17
1
2
3
Dry
Slush
Snow
Wet
Road Surface Condition


Day of Week
6
5
4
3
2
1
0
Crash Count
3
1
5
1
5
4
4
Sunday
Monday
Tuesday
Wednesday
Thursday
Friday
Saturday
Day of Week


Driver Age
9.0
7.5
6.0
4.5
3.0
1.5
0.0
Crash Count
5
4
7
8
6
1
6
1
15-19
20-24
25-29
30-39
40-49
50-59
60-69
Unknown
Driver Age Grouping


Crash Type
18
15
12
9
6
3
0
Crash Count
16
1
1
2
3
Deer
Head-on / Sideswipe
Intersection Movement
Rear End / Sideswipe
Went Off Road
Type of Crash

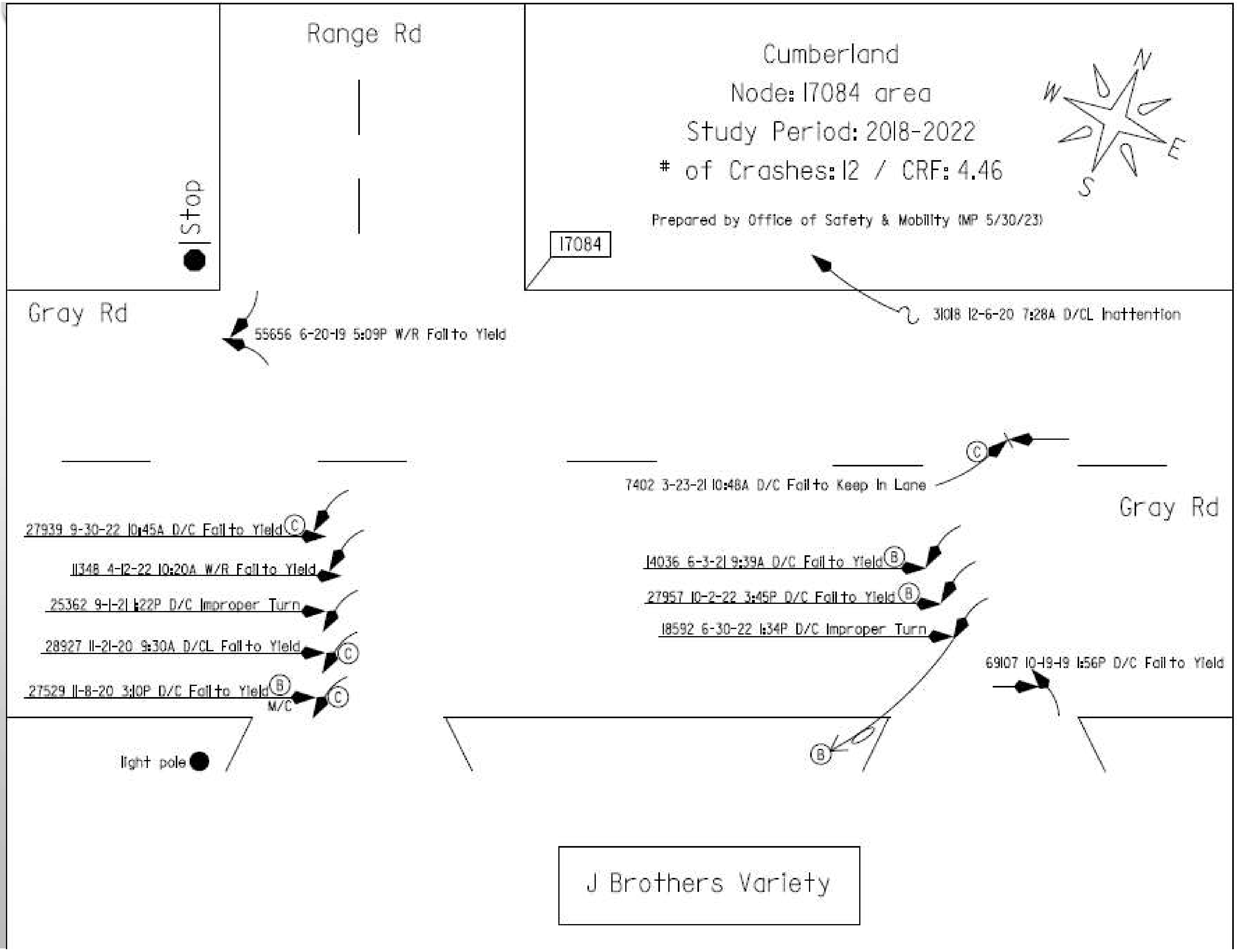
HIGH SPEED ANGLE CRASH SEVERITY

"Angle" Crash Severity By Intersection Speed Limit

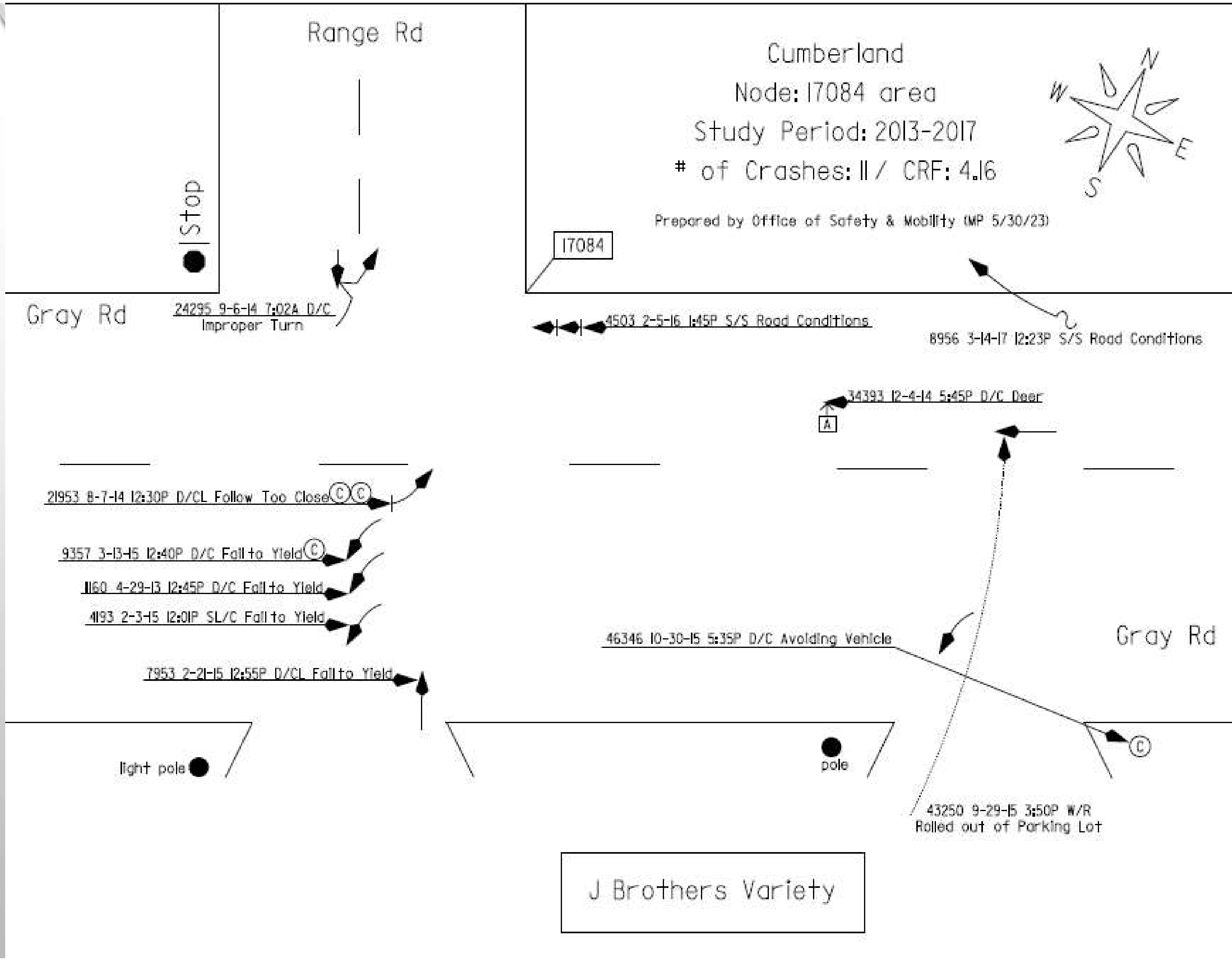
	Injury %	K+A %	K+A+B %
25	25.96%	0.98%	6.30%
30	43.5%	0.0%	17.4%
35	31.65%	2.01%	9.53%
40	34.25%	2.53%	11.96%
45	40.68%	4.38%	15.82%
50	45.27%	5.55%	18.28%
55	49.42%	6.26%	22.74%

THE INTERSECTION IS NOT A HIGH CRASH LOCATION (HCL) OR HAS HISTORY OF BEING HCL.

Route 26 & Range Road @ 50 mph

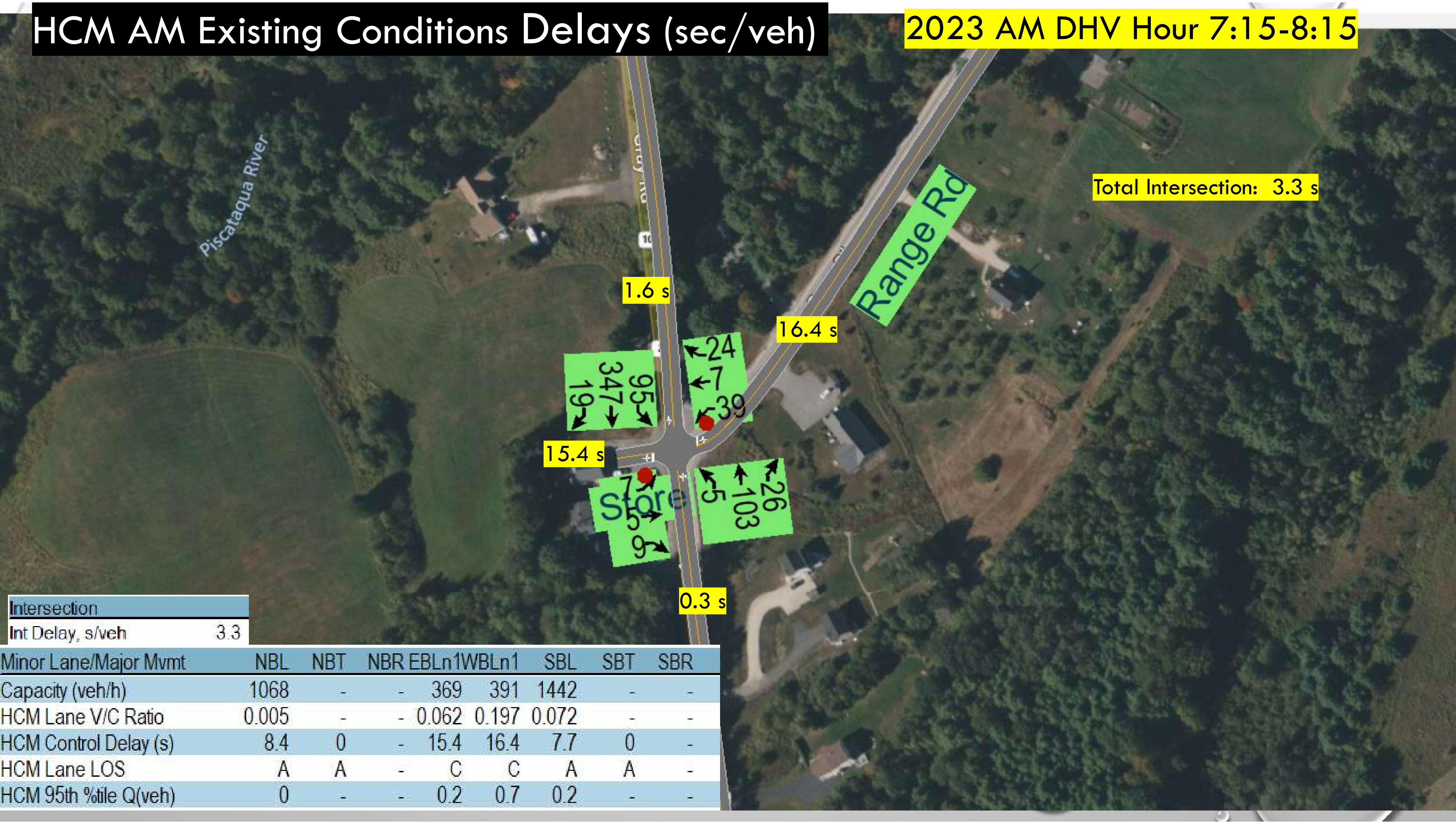


Range Rd
Cumberland
Node: 17084 area
Study Period: 2018-2022
# of Crashes: 12 / CRF: 4.46
Prepared by Office of Safety & Mobility (MP 5/30/23)
N
E
S
W
Stop
17084
Gray Rd
55656 6-20-19 5:09P W/R Fail to Yield
31018 12-6-20 7:28A D/CL Inattention
7402 3-23-21 10:48A D/C Fail to Keep In Lane
C
Gray Rd
27939 9-30-22 10:45A D/C Fail to Yield
C
11348 4-12-22 10:20A W/R Fail to Yield
25362 9-1-21 1:22P D/C Improper Turn
28927 11-21-20 9:30A D/CL Fail to Yield
C
27529 11-8-20 3:10P D/C Fail to Yield
B
M/C
C
14036 6-3-21 9:39A D/C Fail to Yield
B
27957 10-2-22 3:45P D/C Fail to Yield
B
18592 6-30-22 1:34P D/C Improper Turn
69107 10-19-19 1:56P D/C Fail to Yield
B
light pole
J Brothers Variety


Range Rd
Cumberland
Node: 17084 area
Study Period: 2013-2017
# of Crashes: 11 / CRF: 4.16
Prepared by Office of Safety & Mobility (MP 5/30/23)
N
W
E
S
Stop
17084
Gray Rd
24295 9-6-14 7:02A D/C
Improper Turn
4503 2-5-16 1:45P S/S Road Conditions
8956 3-14-17 12:23P S/S Road Conditions
34393 12-4-14 5:45P D/C Deer
A
21953 8-7-14 12:30P D/CL Follow Too Close
C
C
9357 3-13-15 12:40P D/C Fail to Yield
C
1160 4-29-13 12:45P D/C Fail to Yield
4193 2-3-15 12:01P SL/C Fail to Yield
7953 2-21-15 12:55P D/CL Fail to Yield
46346 10-30-15 5:35P D/C Avoiding Vehicle
C
Gray Rd
light pole
pole
43250 9-29-15 3:50P W/R
Rolled out of Parking Lot
J Brothers Variety

HCM AM Existing Conditions Delays (sec/veh)

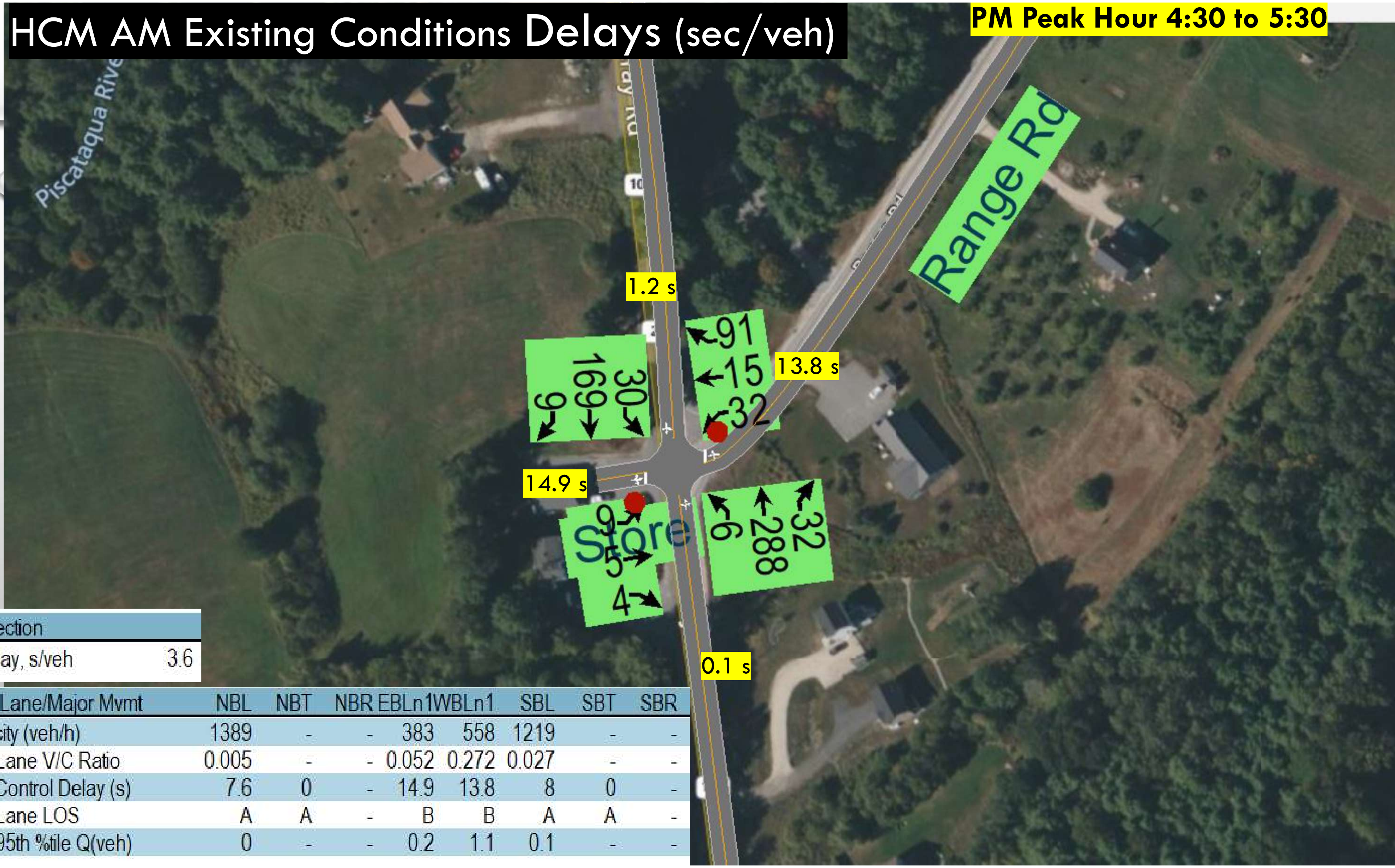
2023 AM DHV Hour 7:15-8:15



Intersection	
Int Delay, s/veh	3.3

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1068	-	-	369	391	1442	-	-
HCM Lane V/C Ratio	0.005	-	-	0.062	0.197	0.072	-	-
HCM Control Delay (s)	8.4	0	-	15.4	16.4	7.7	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.7	0.2	-	-

HCM AM Existing Conditions Delays (sec/veh)



Intersection	
Int Delay, s/veh	3.6

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1389	-	-	383	558	1219	-	-
HCM Lane V/C Ratio	0.005	-	-	0.052	0.272	0.027	-	-
HCM Control Delay (s)	7.6	0	-	14.9	13.8	8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	1.1	0.1	-	-

Summary — Cumberland — Rte 26 & Range Road

May 31, 2023 TM Counts Adjusted for Average Day

Group Factor:	70% Option?	Right Turn Discount?	Lanes		Right Turn Treatment	
0.89	Yes	yes	1	Major/Minor 1	Discounted	All Included

		Discounted	All Included
Warrant 1 Eight-Hour Vehicle Volume			
Warrant 1A		**Not Met**	N/A
Warrant 1B		**Not Met**	N/A
Warrant 1C		**Not Met**	N/A
Warrant 2 Four-Hour Vehicle Volume		**Not Met**	N/A
Warrant 3 Peak Hour			
Warrant 3 A (delay) All three conditions need to be met.		**Not Met**	
1. Delay on minor street	No		
2. Entering volume on minor street	No		
3. Entering volume for intersection	No		
Warrant 3 B (volume - a.m. or p.m.)		**Not Met**	N/A
Warrant 4 Pedestrian Volume			
Warrant 4A (four-hour)		**Not Met**	
Warrant 4B (peak-hour)		**Not Met**	
Warrant 5 School Crossing		**N/A**	
Warrant 6 Coordinated Signal System		**Not Met**	
Warrant 7 Crash Experience		**Not Met**	N/A
Warrant 7 All Three Conditions need to be met			
1. Adequate trials of safety alternatives	no		
2. Five or more crashes in 1 yr correctable by signal	No		
3. 80% of Warrant 1 A or Warrant 1B or Warrant 4	No		
Warrant 8 Roadway Network - N/A		**Not Met**	
1. 1000 or more entering volume at intersection	No		
2. Warrants 1, 2, or 3 in five years	No		
3. Major route / integral to transportation system	No		
Warrant 9 Intersection near a RR Xing - N/A		**N/A**	

NO MUTCD SIGNAL WARRANTS MET

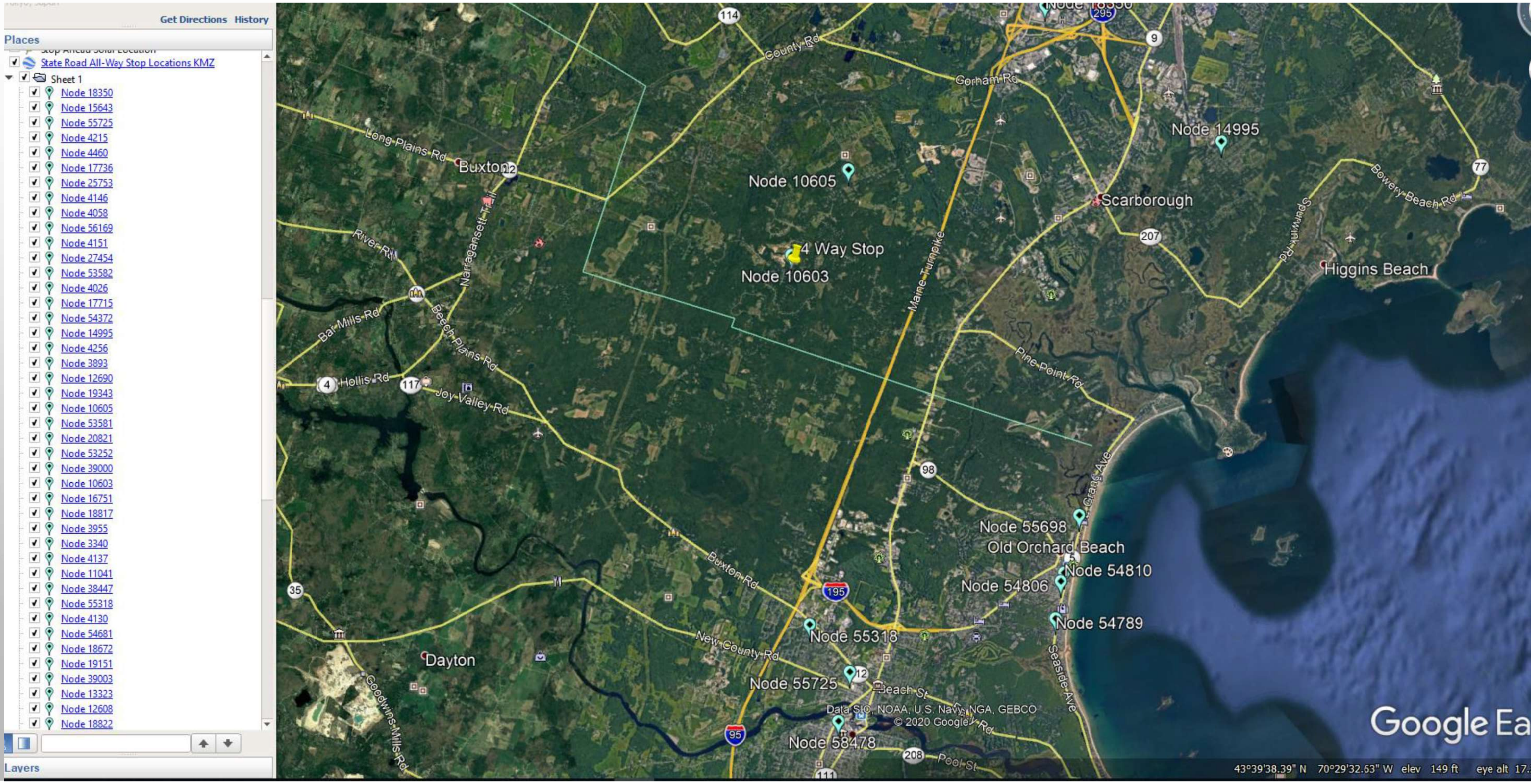
ALTERNATIVES

- TRAFFIC SIGNAL – DID NOT MEET ANY MUTCD SIGNAL WARRANTS.
- ALL WAY STOP – MET WARRANT
- IMPROVE INTERSECTION SIGHT DISTANCE

HOW AWS CAME TO BE CONSIDERED AS AN ALTERNATIVE?

- REVIEWED MAINE EXAMPLES
  - HISTORICAL DATA
  - RECENT EXAMPLES
- NATIONAL STUDIES
  - NORTH CAROLINA MEETING/STUDY

ALL-WAY STOP LOCATIONS



OLDER EXAMPLE OF AWS

NEWER TYPE INSTALLATIONS

HISTORICAL MAINE BEFORE / AFTER

- CRASH REDUCTION = **45%**
- INJURY CRASH REDUCTION = **52%**
- CRASH COST REDUCTION = **54%**

NATIONAL CRASH REDUCTION CONVERT TWO-WAY TO ALL-WAY STOP CONTROL

- CRASH REDUCTION = **82% /61%**
- INJURY CRASH REDUCTION = **87%/72%**

Safety Study Results (2010 Data)

- Safety study of over 50 intersections in NC converted from 2-way stop to AWS.
- The study included a diverse group of four-leg intersections converted to AWS in urban, suburban, and rural areas (included some locations outside of Spot Safety).
- Intersections with a range of volumes and approach speeds were included.
- The study was comprised of locations both with and without overhead and/or sign mounted flashing beacons.
- The overall results indicate a:

68% Reduction in Total Crashes
77% Reduction in Fatal and Injury Crashes
75% Reduction in Frontal Impact Crashes

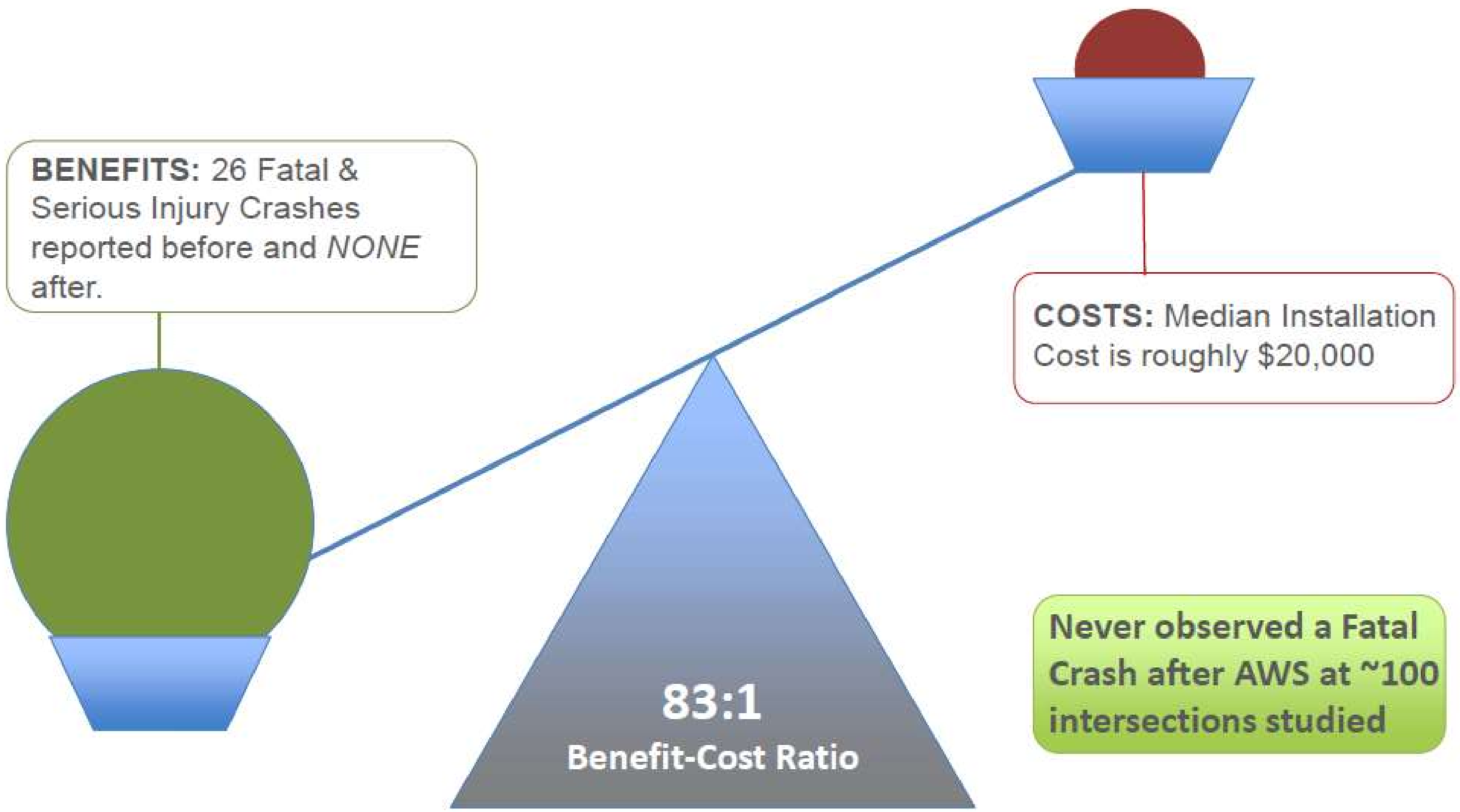
There appears to be an even greater crash reduction at higher speed (45-55 mph) AWS sites.

Crash Severity (2020 Data)

36 AWS Spot Safety Projects at 4-leg Intersections with Before & After Crash Data

Cost and Benefits (2020 Data)

36 AWS Spot Safety Projects at 4-leg Intersections with Before & After Crash Data



Casco Conversion – Route 11 / Route 121

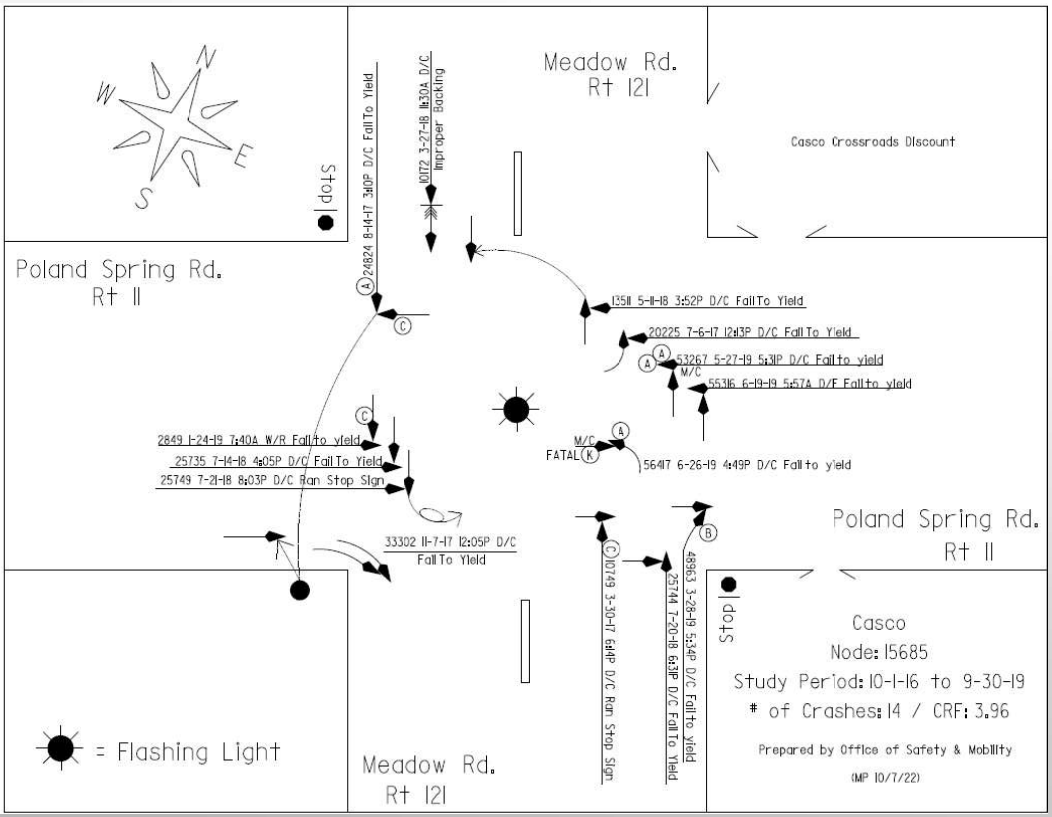
CONVERTED OCTOBER 2019

Crashes Per Year		**Crash Reduction**	
Before	After	**64.3%**	
4.67	1.67		
Injury Crashes Per Year		**Injury Crash Reduction**	
Before	After	**66.7%**	
2.00	0.67		
Fatal / Severe Injury Crash Per Year		**Fatal / Serious Injury Crash Reduction**	
Before	After	**100.0%**	
1.00	0.00		
Crash Cost Per Year		**Crash Cost Reduction**	
Before	After	**97.8%**	
$ 3,918,700	$ 85,467		
Crash Cost Per Crash		**Crashes are on average**	
Before	After	**93.9%**	**Less severe**
$ 839,721.43	$ 51,280.00		

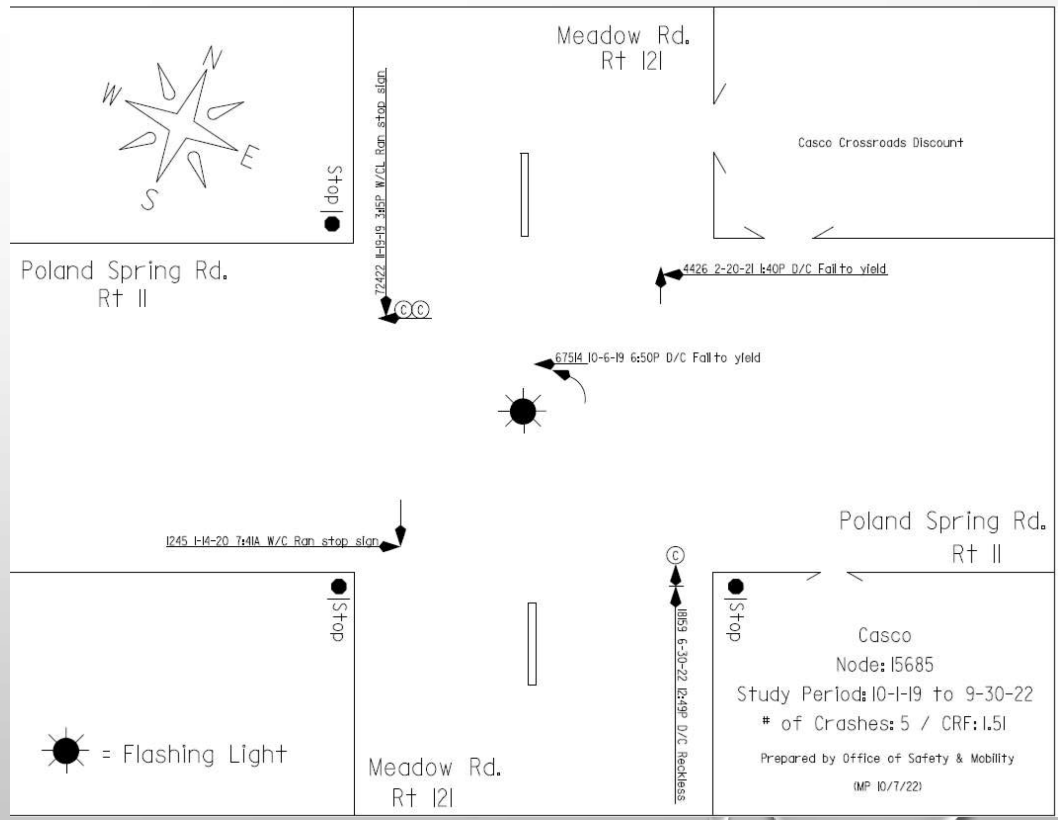
Casco Conversion – Route 11 / Route 121

CONVERTED OCTOBER 2019

CASCO 3-YEARS BEFORE

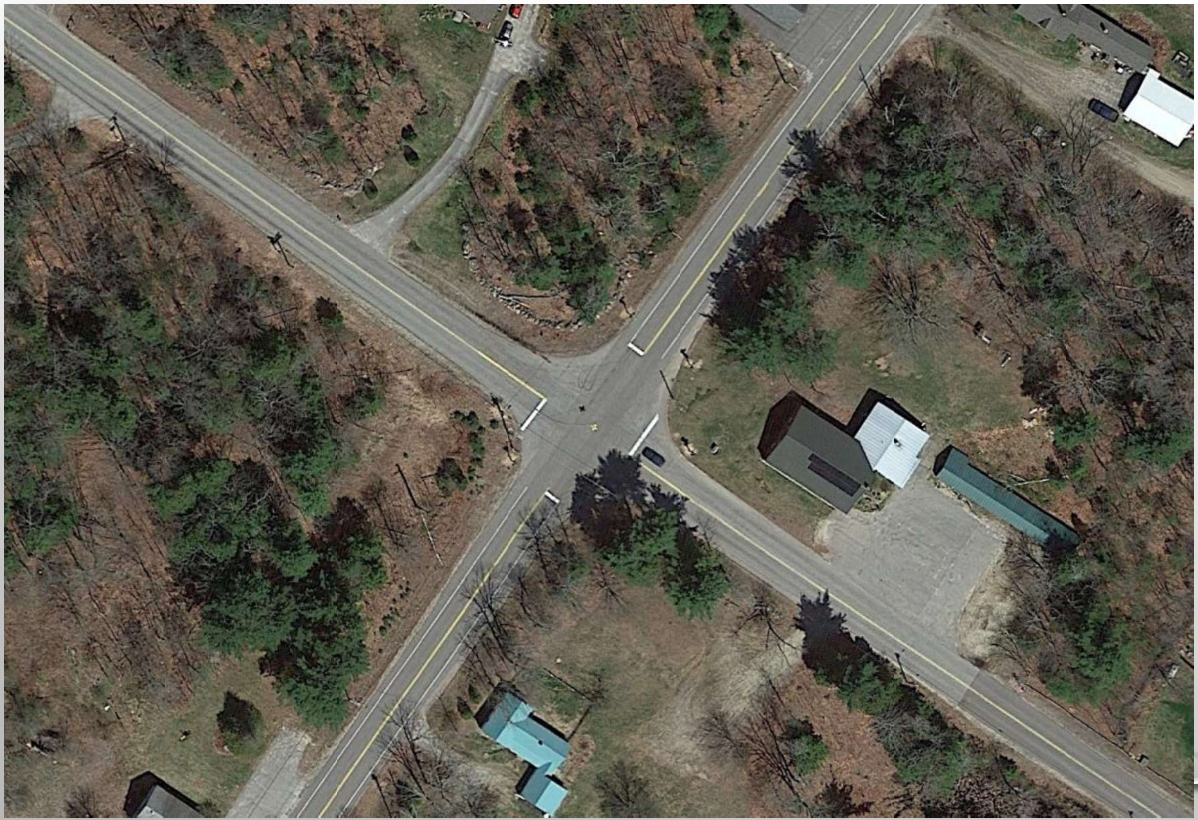


CASCO 3-YEARS AFTER



Durham Conversion – Route 125 / Quaker Meetinghouse Rd

CONVERTED MARCH 2018

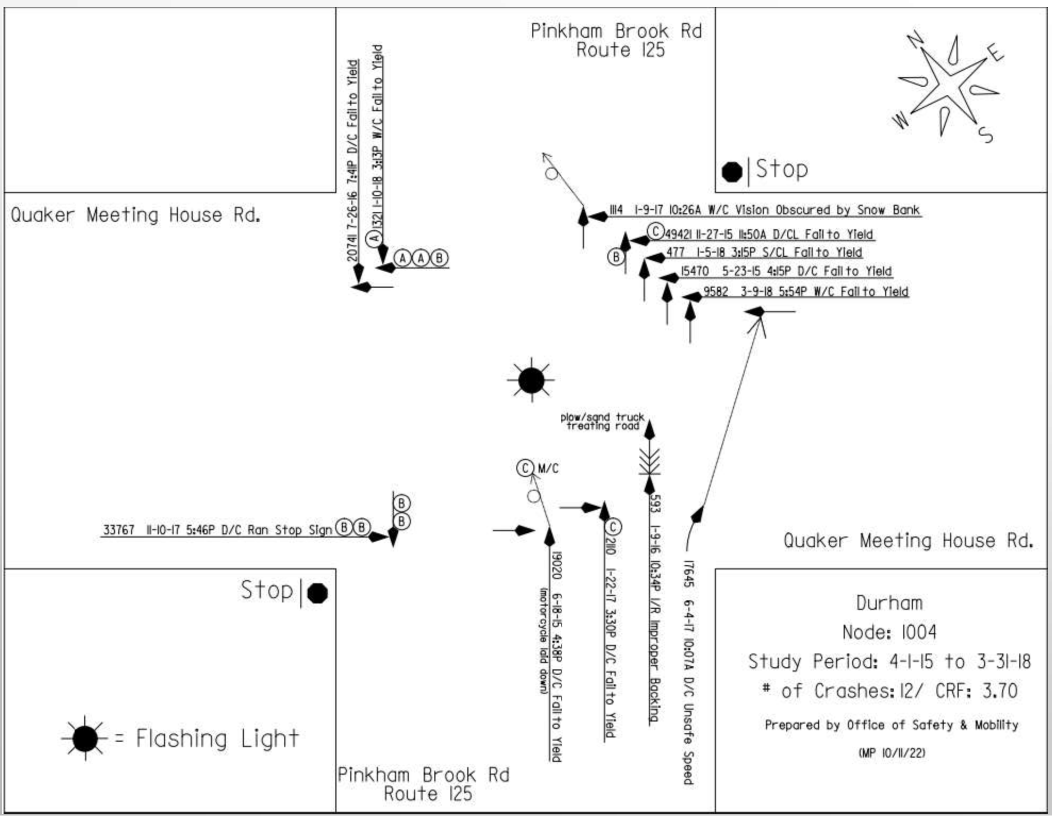


Crashes Per Year			Crash Reduction
Before	After		72.0%
3.30	0.92		
Injury Crashes Per Year			Injury Crash Reduction
Before	After		100.0%
1.90	0.00		
Fatal / Severe Injury Crash Per Year			Fatal / Serious Injury Crash Reduction
Before	After		100.0%
0.30	0.00		
Crash Cost Per Year			Crash Cost Reduction
Before	After		97.6%
$ 409,320	$ 9,792		
Crash Cost Per Crash			Crashes are on average
Before	After		91.5% Less severe
$ 124,036.36	$ 10,600.00		

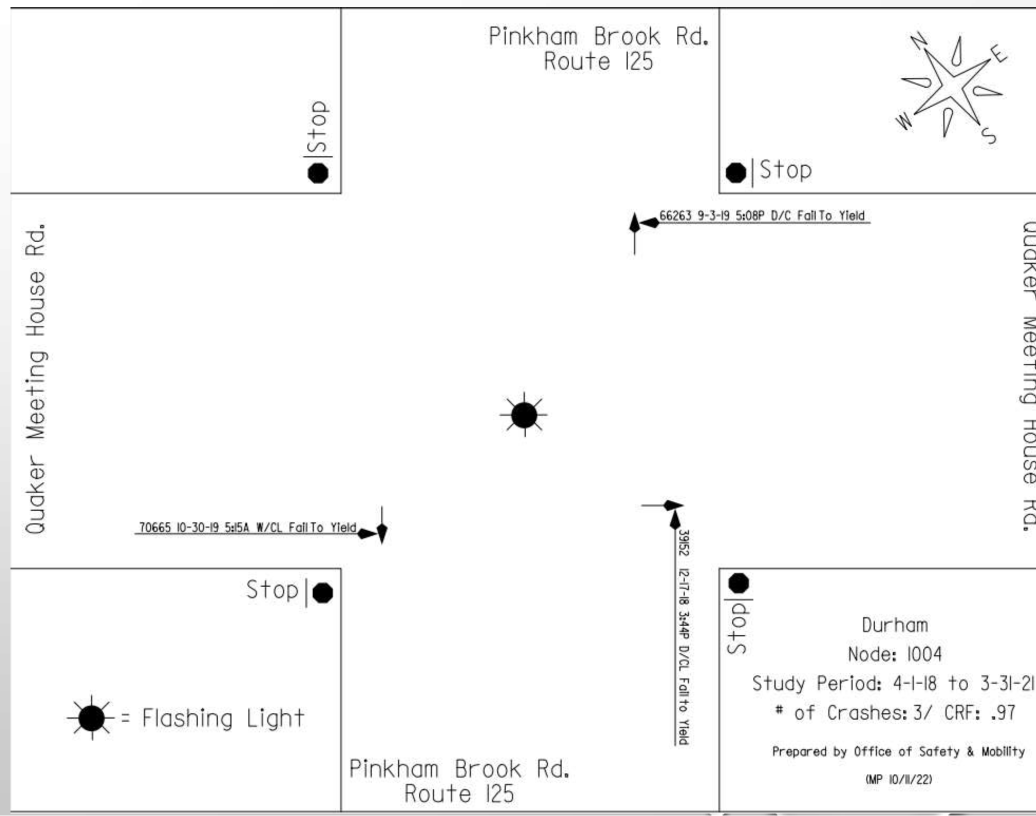
Durham Conversion – Route 125 / Quaker Meetinghouse Rd

CONVERTED MARCH 2018

DURHAM 3-YEARS BEFORE

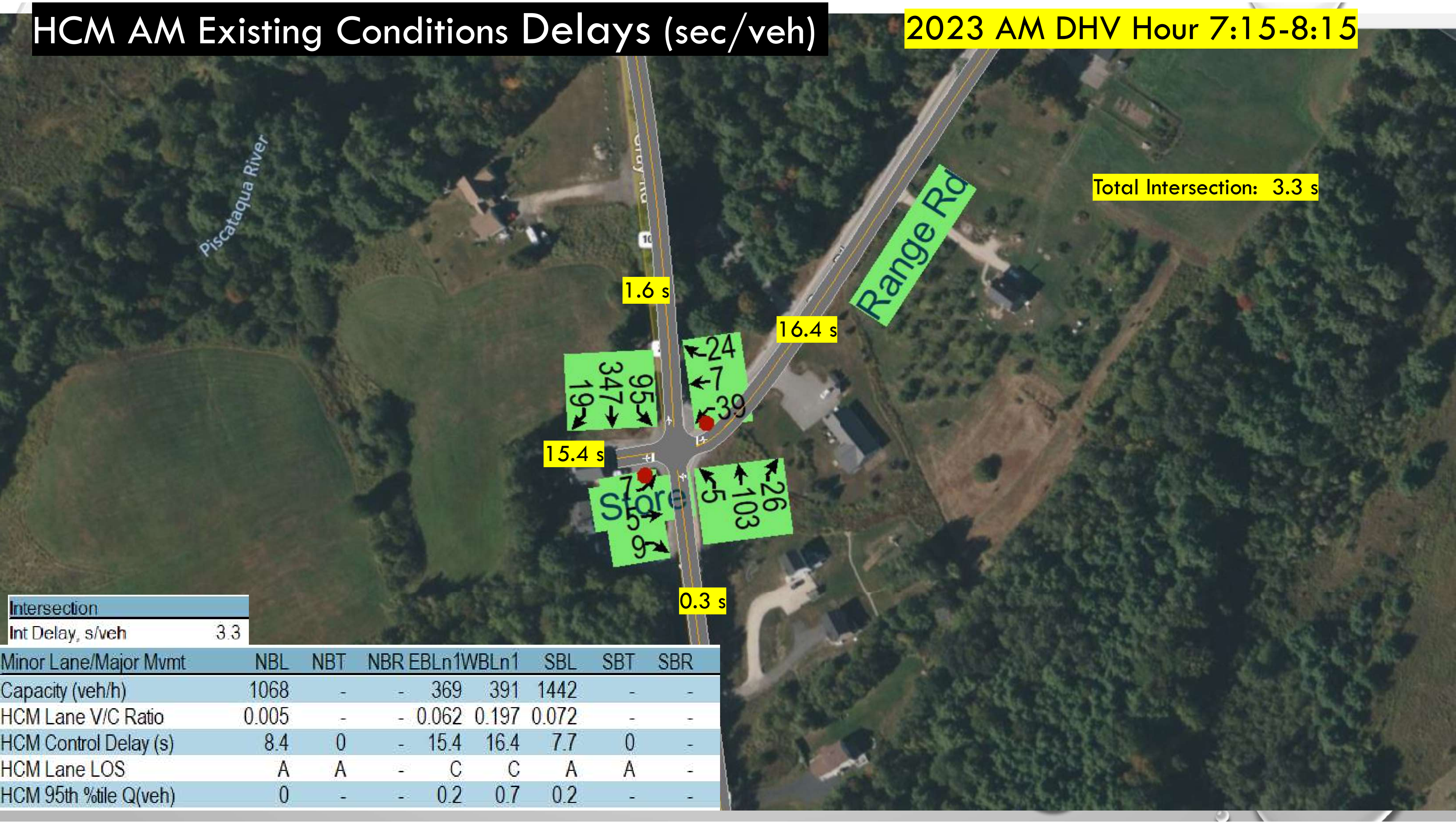


DURHAM 3-YEARS AFTER



HCM AM Existing Conditions Delays (sec/veh)

2023 AM DHV Hour 7:15-8:15



Intersection	
Int Delay, s/veh	3.3

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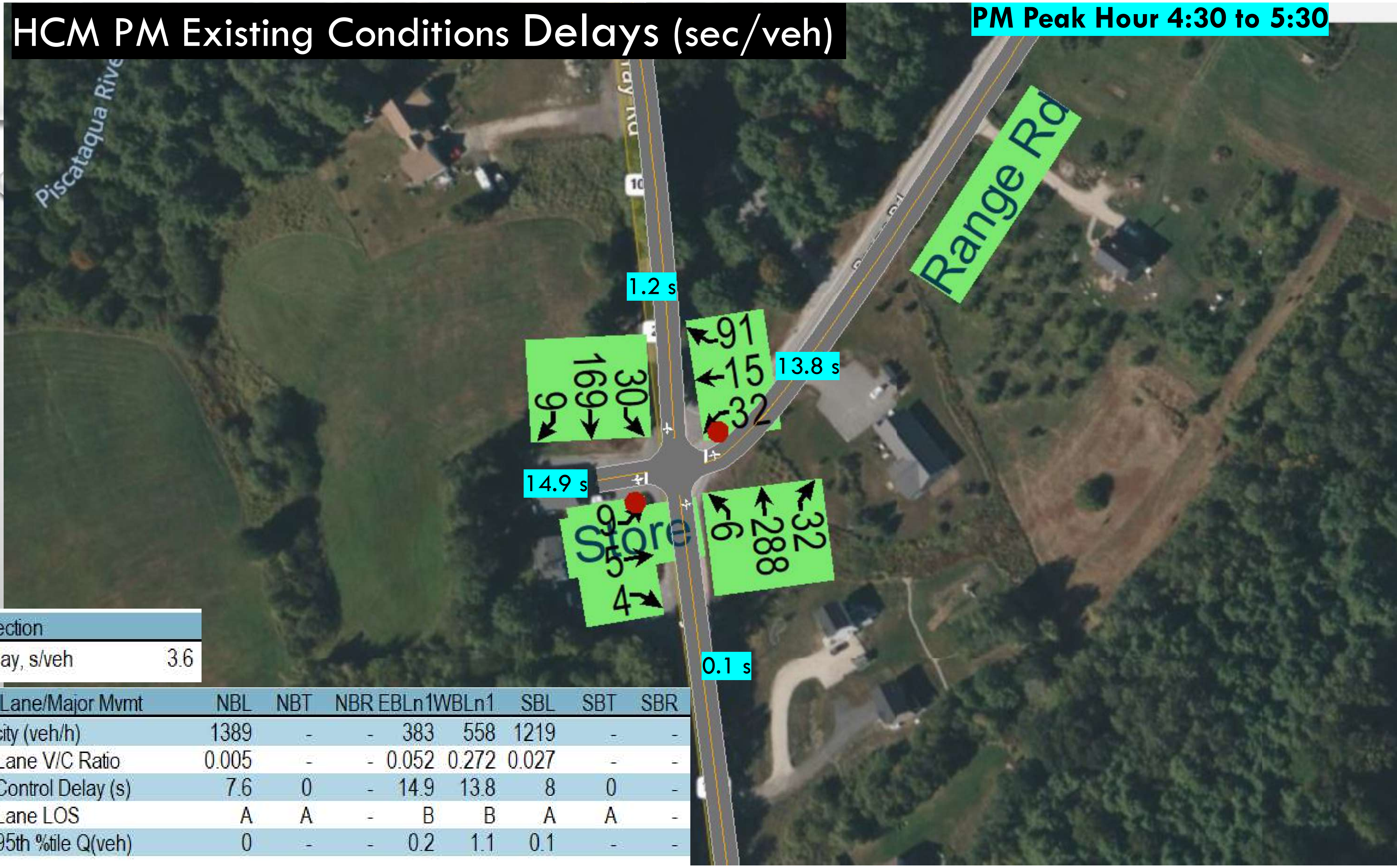
Capacity (veh/h)	1068	-	-	369	391	1442	-	-
HCM Lane V/C Ratio	0.005	-	-	0.062	0.197	0.072	-	-
HCM Control Delay (s)	8.4	0	-	15.4	16.4	7.7	0	-
HCM Lane LOS	A	A	-	C	C	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	0.7	0.2	-	-

HCM PM Existing Conditions Delays (sec/veh)

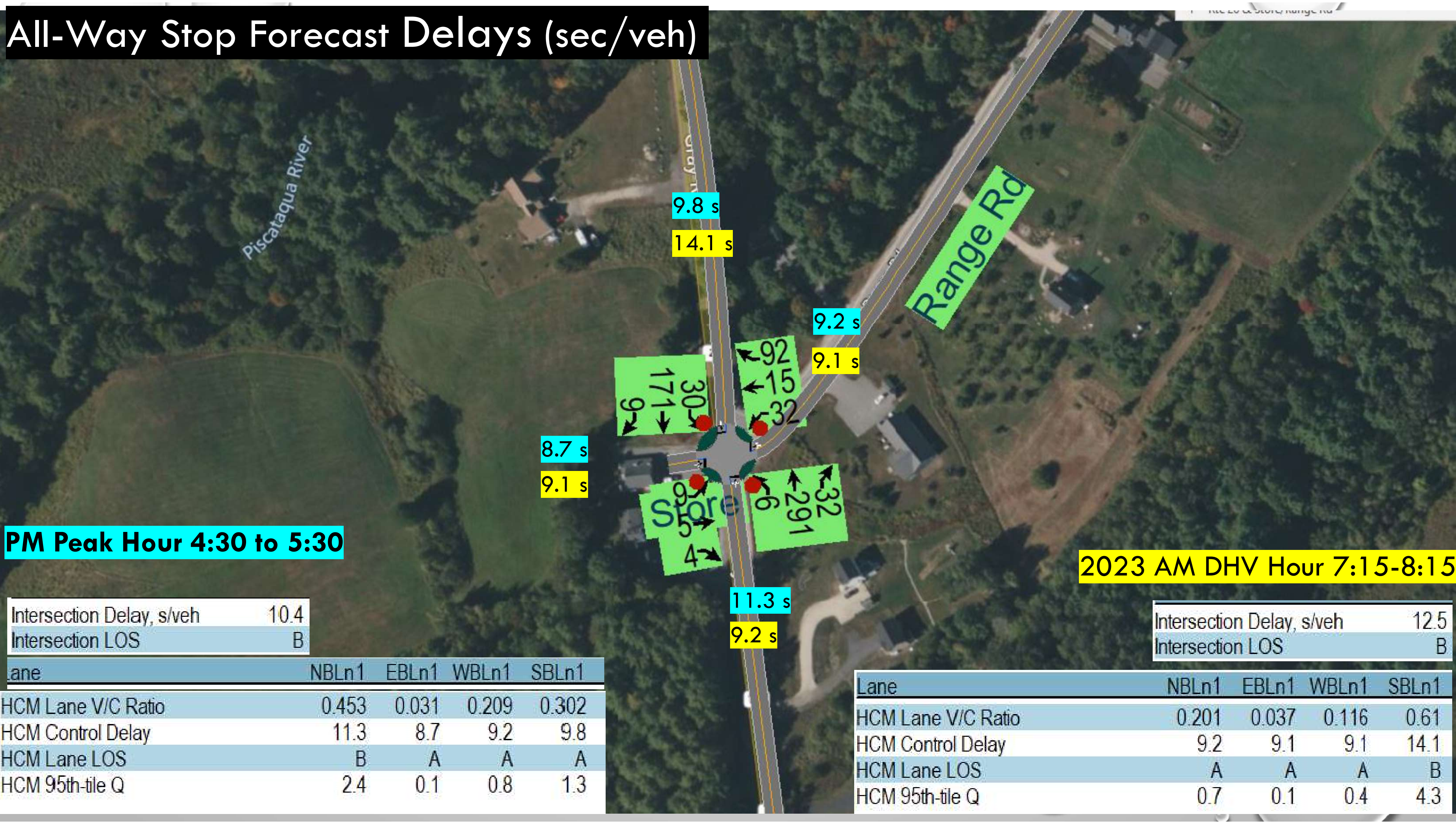
PM Peak Hour 4:30 to 5:30



Intersection	
Int Delay, s/veh	3.6

Minor Lane/Major Mvmt	NBL	NBT	NBR	EBLn1	WBLn1	SBL	SBT	SBR
Capacity (veh/h)	1389	-	-	383	558	1219	-	-
HCM Lane V/C Ratio	0.005	-	-	0.052	0.272	0.027	-	-
HCM Control Delay (s)	7.6	0	-	14.9	13.8	8	0	-
HCM Lane LOS	A	A	-	B	B	A	A	-
HCM 95th %tile Q(veh)	0	-	-	0.2	1.1	0.1	-	-

All-Way Stop Forecast Delays (sec/veh)



PM Peak Hour 4:30 to 5:30

Intersection Delay, s/veh	10.4
Intersection LOS	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
HCM Lane V/C Ratio	0.453	0.031	0.209	0.302
HCM Control Delay	11.3	8.7	9.2	9.8
HCM Lane LOS	B	A	A	A
HCM 95th-tile Q	2.4	0.1	0.8	1.3

2023 AM DHV Hour 7:15-8:15

Intersection Delay, s/veh	12.5
Intersection LOS	B

Lane	NBLn1	EBLn1	WBLn1	SBLn1
HCM Lane V/C Ratio	0.201	0.037	0.116	0.61
HCM Control Delay	9.2	9.1	9.1	14.1
HCM Lane LOS	A	A	A	B
HCM 95th-tile Q	0.7	0.1	0.4	4.3

Cumberland Route 26 & Range Road B/C Analysis

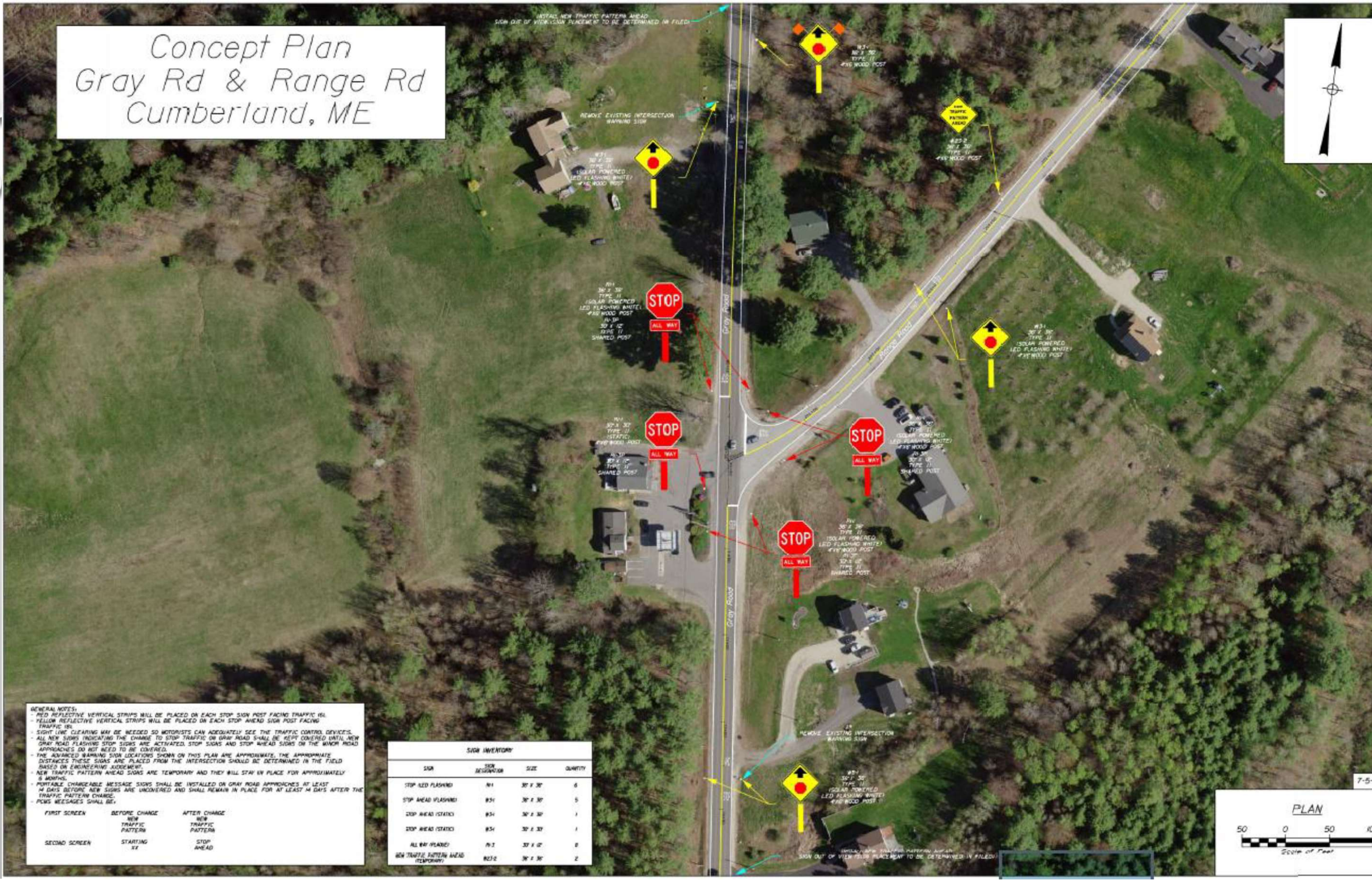
Benefit-Cost Analysis

Alternative	Analysis Duration	Safety Benefit	Mobility Benefit	Net Benefit	Cost Estimate	Net Benefit-Cost
AWS	10 Years	$2,892,280	-$175,450	$2,716,830	$20,000	135.84

BENEFITS OF AN ALL-WAY STOP

- SIGNIFICANT REDUCTION IN TOTAL CRASHES.
- SIGNIFICANT REDUCTION IN INJURY CRASH SEVERITY.
- ZERO FATAL CRASHES AT AWS SINCE 2003.
- HIGH SAFETY BENEFIT / COST RATIO.
- VEHICLES ENTER THE INTERSECTION AT LOW SPEEDS.
- MINIMAL DELAY WITH EACH CONVERSION.

Concept Plan
Gray Rd & Range Rd
Cumberland, ME



GENERAL NOTES:
- RED REFLECTIVE VERTICAL STRIPS WILL BE PLACED ON EACH STOP SIGN POST FACING TRAFFIC (6).
- YELLOW REFLECTIVE VERTICAL STRIPS WILL BE PLACED ON EACH STOP AHEAD SIGN POST FACING TRAFFIC (6).
- SIGHT LINE CLEARING MAY BE NEEDED SO MOTORISTS CAN ADEQUATELY SEE THE TRAFFIC CONTROL DEVICES.
- ALL NEW SIGNS INDICATING THE CHANGE TO STOP TRAFFIC ON GRAY ROAD SHALL BE KEPT COVERED UNTIL NEW GRAY ROAD FLASHING STOP SIGNS ARE ACTIVATED. STOP SIGNS AND STOP AHEAD SIGNS ON THE MINOR ROAD APPROACHES DO NOT NEED TO BE COVERED.
- THE ADVANCED WARNING SIGN LOCATIONS SHOWN ON THIS PLAN ARE APPROXIMATE. THE APPROPRIATE DISTANCES THESE SIGNS ARE PLACED FROM THE INTERSECTION SHOULD BE DETERMINED IN THE FIELD BASED ON ENGINEERING JUDGEMENT.
- NEW TRAFFIC PATTERN AHEAD SIGNS ARE TEMPORARY AND THEY WILL STAY IN PLACE FOR APPROXIMATELY 6 MONTHS.
- PORTABLE CHANGEABLE MESSAGE SIGNS SHALL BE INSTALLED ON GRAY ROAD APPROACHES AT LEAST 14 DAYS BEFORE NEW SIGNS ARE UNCOVERED AND SHALL REMAIN IN PLACE FOR AT LEAST 14 DAYS AFTER THE TRAFFIC PATTERN CHANGE.
- PCMS MESSAGES SHALL BE:

	BEFORE CHANGE	AFTER CHANGE
FIRST SCREEN	NEW TRAFFIC PATTERN	NEW TRAFFIC PATTERN
SECOND SCREEN	STARTING XX	STOP AHEAD

SIGN INVENTORY

SIGN	SIGN DESIGNATION	SIZE	QUANTITY
STOP (LED FLASHING)	R1-1	30" X 30"	6
STOP AHEAD (FLASHING)	W3-1	30" X 30"	5
STOP AHEAD (STATIC)	W3-1	30" X 30"	1
STOP AHEAD (STATIC)	W3-1	30" X 30"	1
ALL WAY (PLAQUE)	R1-3	30" X 12"	8
NEW TRAFFIC PATTERN AHEAD (TEMPORARY)	W23-2	36" X 36"	2

Crash Costs and Benefits of Intersection Alternatives

Intersection Alternative	Intersection Type 3ST (3-leg, 1-stop) 4ST (4-leg, 2-stop) 4SG (4-leg, signal)	All-Way Stop?	Major road speed limit (mph) (If observed speeds are high, this can be increased to rounded 85th percentile speed minus 10)	Total Crashes per Year Observed	Estimated Predicted	Expected	Crash Estimate to Compare	Total	Crashes per Year for Comparison Injury %	FI (fatal and injury)	PDO (property damage only)	Unit Crash Costs ($) FI	PDO	Crash Costs ($) Annual	Pres Worth (based on 10 years)	Benefits ($) Present Worth
Baseline	4ST	No	50	2.60	1.23	1.54	Expected	1.54	38.1%	0.59	0.95	$391,162	$10,600	$239,663	$1,763,938	-
All Way Stop	4ST	Yes	50	2.60	0.21	0.33	Expected	0.33	28.6%	0.09	0.24	$154,416	$10,600	$17,061	$125,572	
				-			Expected	0.00	0.0%	0.00	0.00	$0	$10,600	$0	$0	$0
				-			Expected	0.00	0.0%	0.00	0.00	$0	$10,600	$0	$0	$0
Worksheet Source				3A	3A	3A				3B	3B			Discount Rate		6%

dropdown menu inputs | manual inputs | **final results**

HSM Analysis

Baseline Present Worth	$	1,763,938
All Way Stop Present Worth	$	125,572
Safety Benefit	$	1,638,366

10-Year Analysis *(See details on sheet named "Intersection Alts (10-year)*

Baseline Present Worth	$	2,980,407
All Way Stop Present Worth	$	88,127
Safety Benefit	$	2,892,280

Recommended Analysis: 10-Year

Baseline Present Worth	$	2,980,407
All Way Stop Present Worth	$	88,127
Safety Benefit	**$**	**2,892,280**

Safety Benefit-to-Cost Evaluation

Do you have a cost estimate for the proposed alternative?	Yes
Enter proposed alternative cost	$20,000
Safety Benefit to Cost Ratio	**144.61**

CMF ID: 9656

CHANGE INTERSECTION SIGHT DISTANCE

DESCRIPTION:

PRIOR CONDITION: INTERSECTIONS WITH A BASE SIGHT DISTANCE

CATEGORY: INTERSECTION GEOMETRY

STUDY: *SAFETY EVALUATION OF GEOMETRIC DESIGN CRITERIA: INTERSECTION SIGHT DISTANCE AT UNSIGNALIZED INTERSECTIONS, HIMES ET AL., 2018*

Star Quality Rating:	★★★☆☆ [VIEW SCORE DETAILS]
Rating Points Total:	90

Crash Modification Factor (CMF)

Value:

$$CMF_{T_i} = \frac{\exp\left(-0.021 \times PSL + \frac{7.194 \times PSL}{ISD_i} + \frac{-243.009 \times LowAADT_{maj}}{ISD_i} + \frac{-177.826 \times MidAADT_{maj}}{ISD_i}\right)}{\exp\left(-0.021 \times PSL + \frac{7.194 \times PSL}{ISD_{base}} + \frac{-243.009 \times LowAADT_{maj}}{ISD_{base}} + \frac{-177.826 \times MidAADT_{maj}}{ISD_{base}}\right)}$$

where:

PSL = Posted speed (in mph).

$LowAADT_{maj}$ = 1 if major road AADT ≤ 5,000; otherwise 0.

$MidAADT_{maj}$ = 1 if 5,000 < major road AADT ≤ 15,000; otherwise 0.

ISD_i = Proposed or existing available intersection sight distance for the condition of interest i (where i = 1 for proposed condition and i = 2 for existing condition) (in feet).

ISD_{base} = Base intersection sight distance for an approach direction (in feet). For practical applications, this value is assumed to be 1,320 feet.

Cumberland Route 26 / Range Road

Based on Posted Speed of 50		
Increasing Sight Distance from 30 mph to 50 mph		
		0.621
		37.9% Crash Reduction
Posted Speed Limit	50	
Proposed Sight Distance	555	
Low AADT	0	
Mid AADT	0	
Existing Sight Distance	320	

Crash Costs and Benefits of Intersection Alternatives

Intersection Alternative	Intersection Type 3ST (3-leg, 1-stop) 4ST (4-leg, 2-stop) 4SG (4-leg, signal)	All-Way Stop?	Major road speed limit (mph) (If observed speeds are high, this can be increased to rounded 85th percentile speed minus 10)	Total Crashes per Year			Crash Estimate to Compare		Crashes per Year for Comparison			Unit Crash Costs ($)		Crash Costs ($)		Benefits ($)
				Observed	Estimated			Total	Injury %	FI (fatal and injury)	PDO (property damage only)	FI	PDO	Annual	Pres Worth (based on 20 years)	Present Worth
					Predicted	Expected										
Baseline	4ST	No	50	2.60	1.23	1.54	Expected	1.54	38.1%	0.59	0.95	$391,162	$10,600	$239,663	$2,748,912	-
Improve ISD (320 ft to 555)	4ST	No	50	2.60	0.76	1.05	Expected	1.05	38.1%	0.40	0.65	$391,162	$10,600	$162,869	$1,868,091	
				-			Expected	0.00	0.0%	0.00	0.00	$0	$10,600	$0	$0	$0
				-			Expected	0.00	0.0%	0.00	0.00	$0	$10,600	$0	$0	$0
Worksheet Source				3A	3A	3A				3B	3B			Discount Rate		6%

dropdown menu inputs | manual inputs | **final results**

HSM Analysis

Baseline Present Worth	$	2,748,912
Improve ISD (320 ft to 555) Present Worth	$	1,868,091
Safety Benefit	$	880,821

10-Year Analysis *(See details on sheet named "Intersection Alts (10-year)*

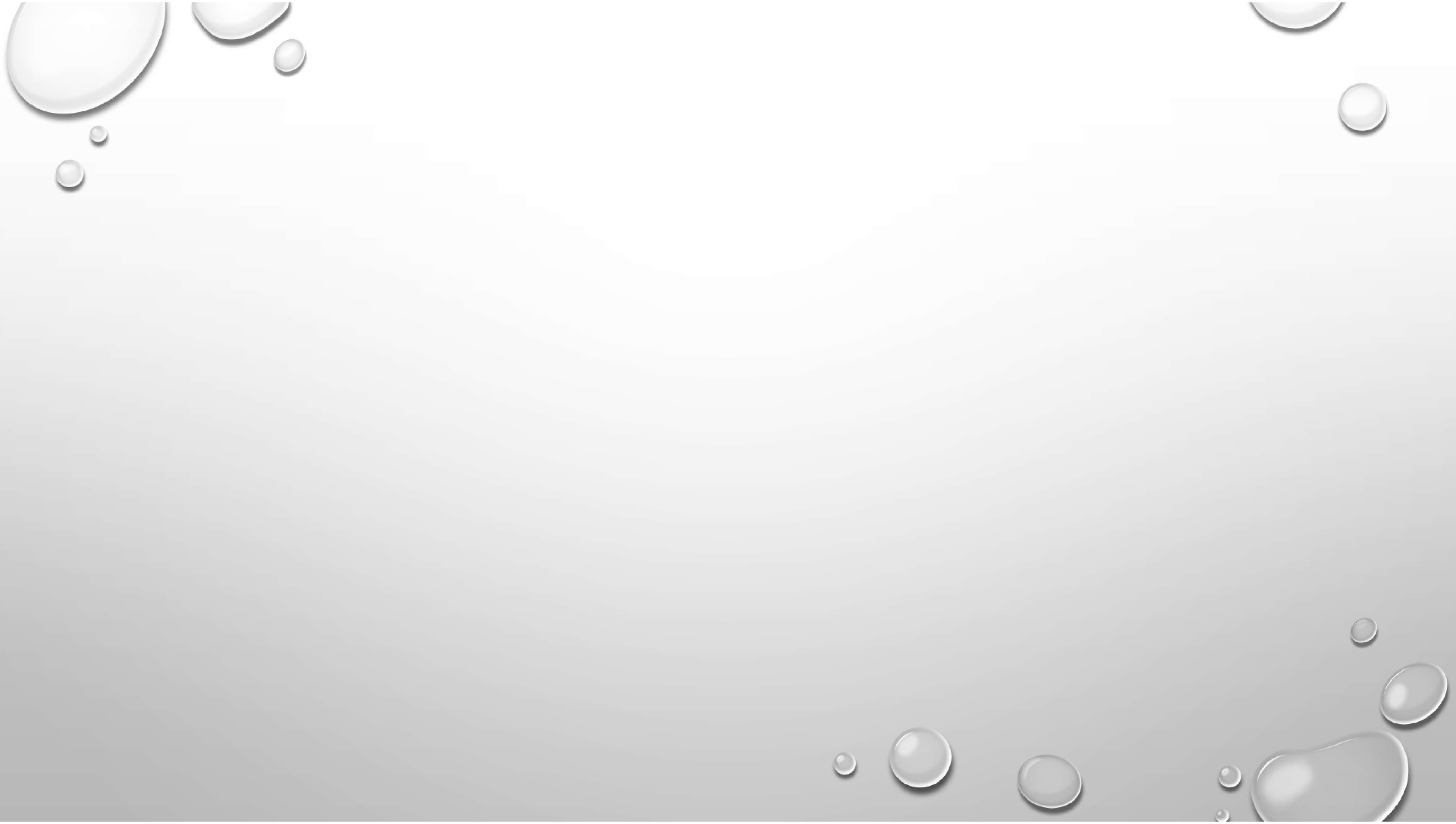
Baseline Present Worth	$	4,644,650
Improve ISD (320 ft to 555) Present Worth	$	3,156,386
Safety Benefit	$	1,488,264

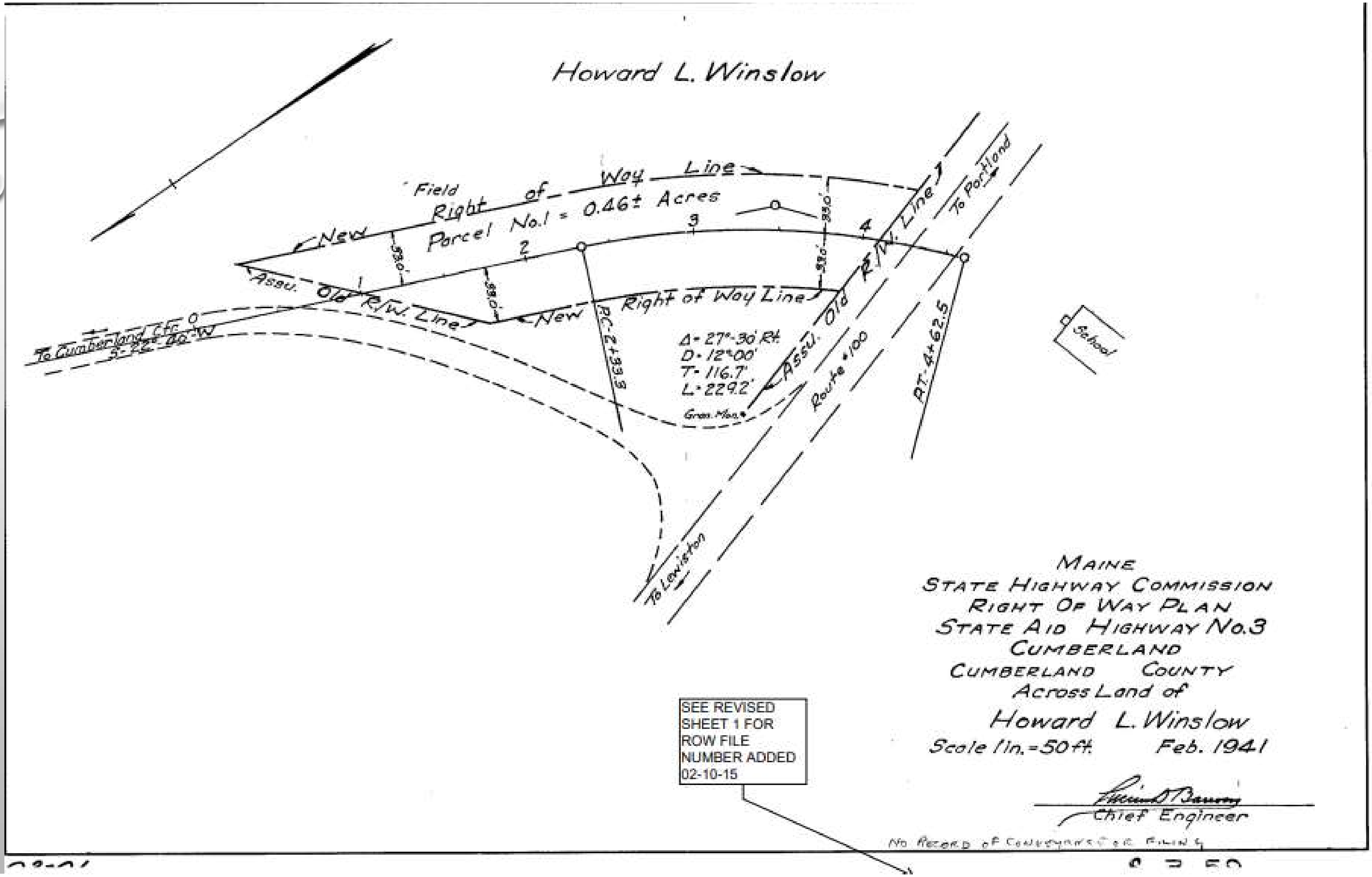
Recommended Analysis: 10-Year

Baseline Present Worth	$	4,644,650
Improve ISD (320 ft to 555) Present Worth	$	3,156,386
Safety Benefit	**$**	**1,488,264**

Safety Benefit-to-Cost Evaluation

Do you have a cost estimate for the proposed alternative?	Yes
Enter proposed alternative cost	$1,200,000
Safety Benefit to Cost Ratio	**1.24**




Howard L. Winslow
Field Right of Way Line
New
Parcel No.1 = 0.46± Acres
1
2
3
4
33.0'
Assu. Old R/W. Line
New Right of Way Line
To Cumberland Ctr. 0
S-72°-00'-W
P.C.-2+33.8
Δ-27°-30' Rt.
D-12°00'
T-116.7'
L-229.2'
Gran. Mon.
Assu. Old R/W. Line
Route #100
P.T.-4+62.5
To Portland
To Lewiston
School
Maine
State Highway Commission
Right Of Way Plan
State Aid Highway No.3
Cumberland
Cumberland County
Across Land of
Howard L. Winslow
Scale 1 in.=50 ft.
Feb. 1941
Chief Engineer
SEE REVISED SHEET 1 FOR ROW FILE NUMBER ADDED 02-10-15
No Record of Conveyances for Filing