

Appendix C-4
Accident Studies

Accident Summaries for I-81

ACCIDENT SUMMARY SHEET

ROUTE: 81I **LOCATION:** Syracuse, New York
MUNICIPALITY: _____ **COUNTY:** _____
TIME PERIOD COVERED: 7/1/2010 - 6/30/2013 **REFERENCE MARKERS / NODES:** 81I 3303 2006 - 81I 3303 3066
REMARKS: All Accidents **DATE:** 11/6/2014

TIME OF DAY 6 AM - 10 AM 261 20.0% 10 AM - 4 PM 399 30.6% 4 PM - 7 PM 326 25.0% 7 PM - 12 AM 186 14.2% 12 AM - 6 AM 129 9.9% Unspecified 5 0.4% Total 1306	DIRECTION North 1167 53.1% South 1029 46.9% East 0 0.0% West 0 0.0% Total 2196	DIRECTION Northeast 0 0.0% Northwest 0 0.0% Southeast 0 0.0% Southwest 0 0.0% Unspecified 0 0.0%
WEATHER Clear 488 37.4% Cloudy 343 26.3% Rain 188 14.4% Snow 257 19.7% Sleet/Hail/Freezing Rain 20 1.5% Fog/Smog/Smoke 1 0.1% Unspecified 9 0.7% Total 1306	ACCIDENT TYPE Rear End 404 30.9% Overtake 311 23.8% Right Angle 20 1.5% Left Turn 0 0.0% Right Turn 0 0.0% Fixed Object 387 29.6% Head On 9 0.7% Sideswipe 0 0.0% Total 1306	ACCIDENT TYPE Pedestrian 2 0.2% Bicycle 0 0.0% Parked Vehicle 0 0.0% Backing 0 0.0% Run Off The Road 27 2.1% Animal 30 2.3% Other 95 7.3% Unspecified 21 1.6% Total 1306
SURFACE Dry 704 53.9% Wet 316 24.2% Mud/Slush 26 2.0% Snow/Ice 252 19.3% Unspecified 8 0.6% Total 1306	ACCIDENT SEVERITY Fatal 2 0.2% Injury 267 20.4% Property Damage 1032 79.0% Non-Reportable 5 0.4% Total 1306	
TIME OF YEAR Winter (Dec-Feb) 430 32.9% Spring (Mar-May) 326 25.0% Summer (Jun-Aug) 276 21.1% Fall (Sep-Nov) 274 21.0% Total 1306	TYPE OF VEHICLE Passenger Cars 2220 93.2% Commercial Vehicles 163 6.8% Total 2383	
DAY OF WEEK Sunday 144 11.0% Monday 171 13.1% Tuesday 196 15.0% Wednesday 208 15.9% Thursday 187 14.3% Friday 226 17.3% Saturday 174 13.3% Total 1306	LIGHT CONDITION Daylight 852 65.2% Dawn/Dusk 52 4.0% Night 395 30.2% Unspecified 7 0.5% Total 1306	

SUMMARY OF ACCIDENT SEVERITY BY YEAR:

	2010	2011	2012	2013
Fatal Accidents	0	1	1	0
Injury Accidents	51	79	90	47
Property Damage Accidents	150	322	352	208
Non-Reportable Accidents	0	1	4	0
Total Accidents	201	403	447	255

HSA CHARTS

ROUTE: 81I

LOCATION: Syracuse, New York

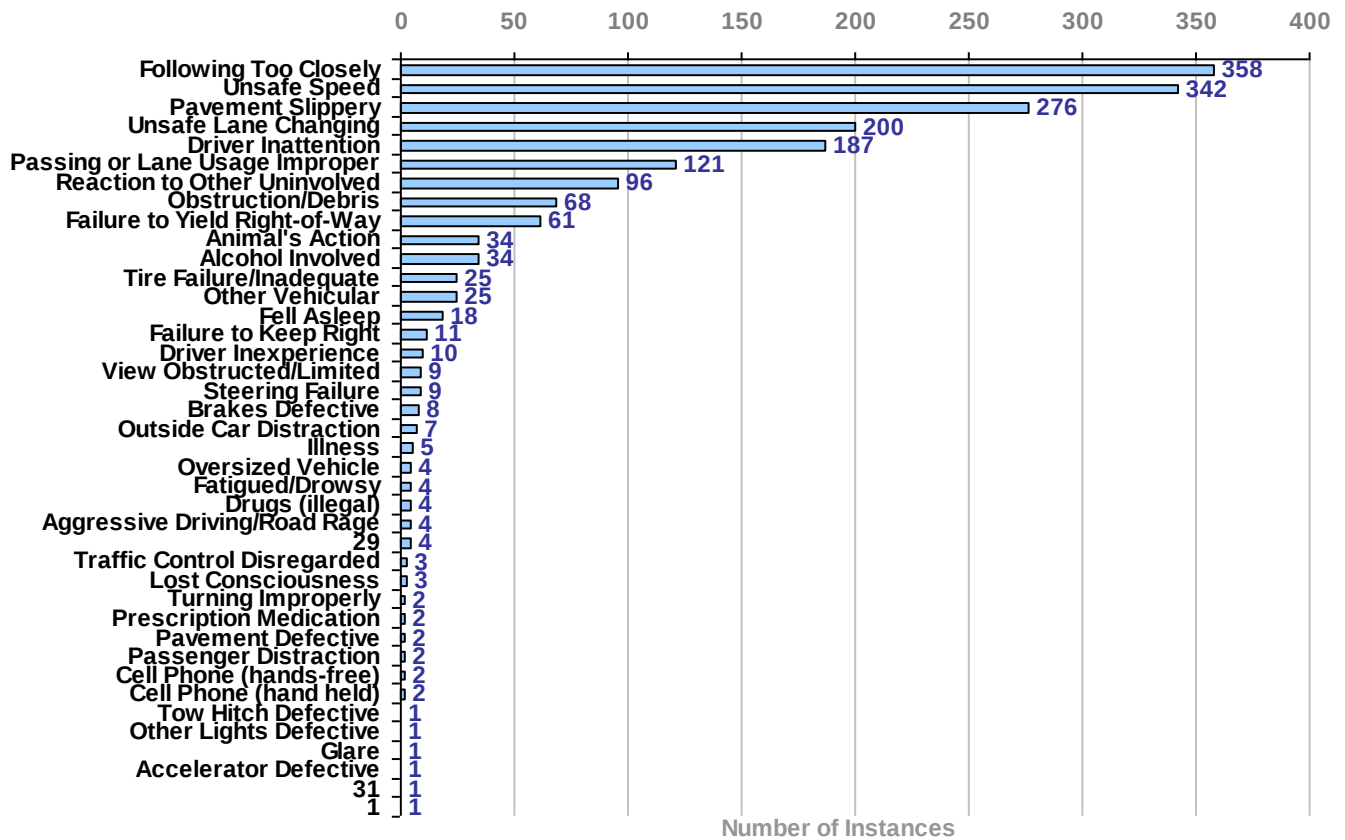
TIME PERIOD COVERED: 7/1/2010 - 6/30/2013

REFERENCE MARKERS / NODES 81I 3303 2006 - 81I 3303 3066

REMARKS: All Accidents

DATE: 11/6/2014

ACCIDENT CONTRIBUTING FACTORS



HSA CHARTS

ROUTE: 81/

LOCATION: Syracuse, New York

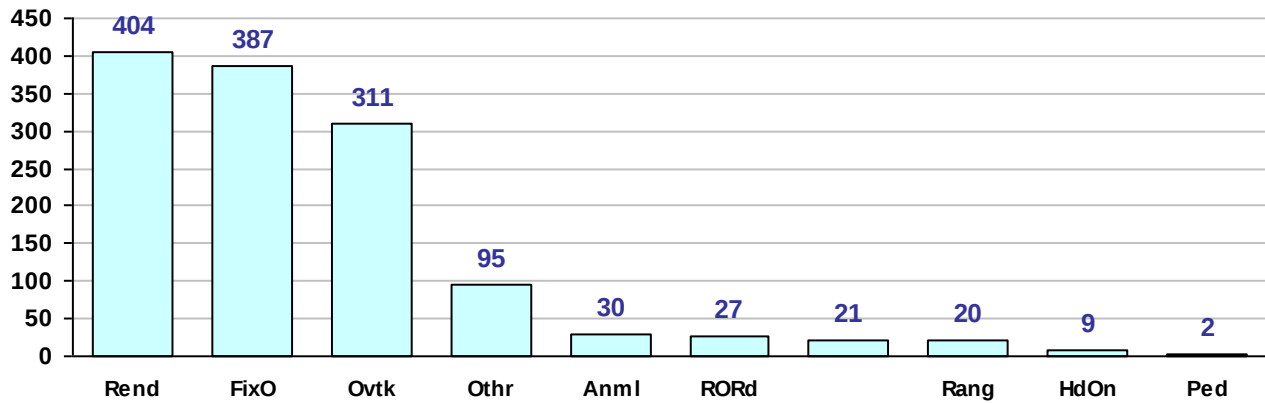
TIME PERIOD COVERED: 7/1/2010 - 6/30/2013

REFERENCE MARKERS / NODES 81/ 3303 2006 - 81/ 3303 3066

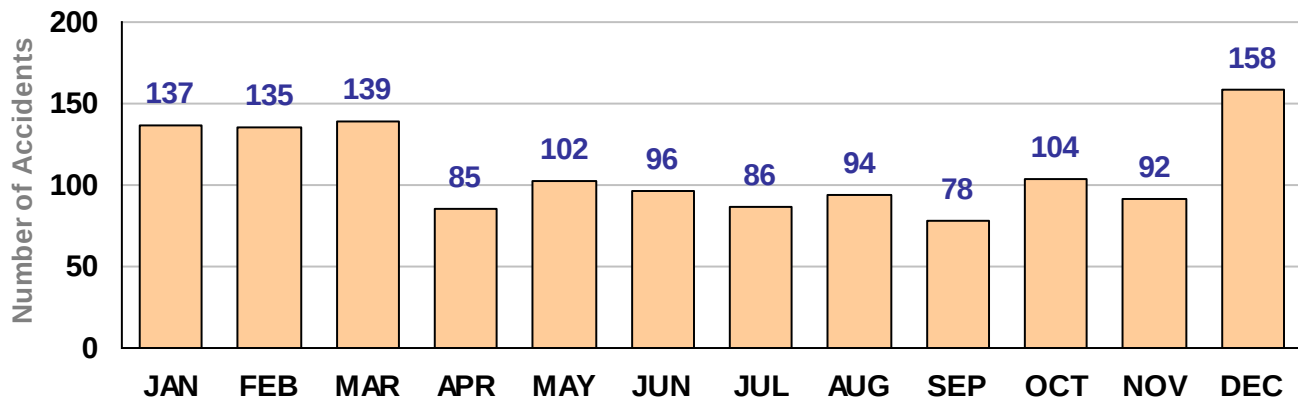
REMARKS: All Accidents

DATE: 11/6/2014

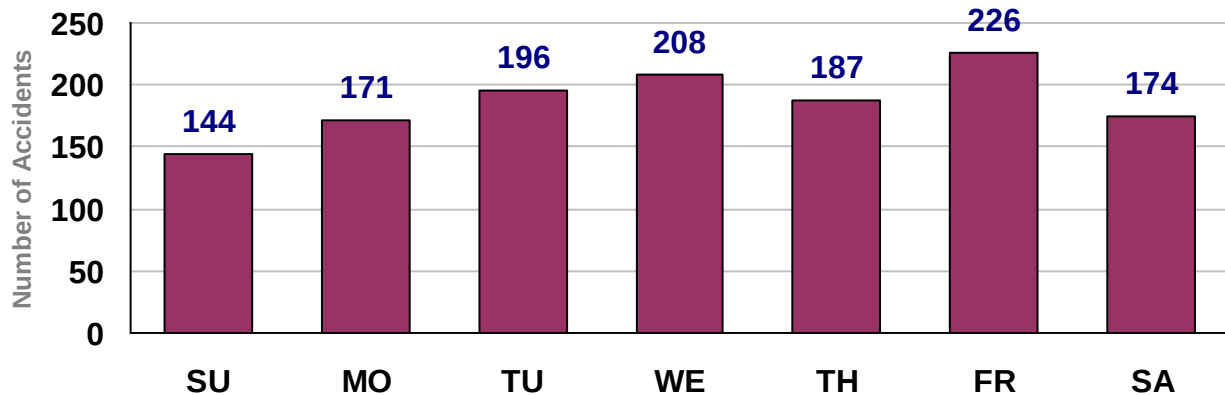
NUMBER OF ACCIDENTS BY TYPE



ACCIDENTS BY MONTH



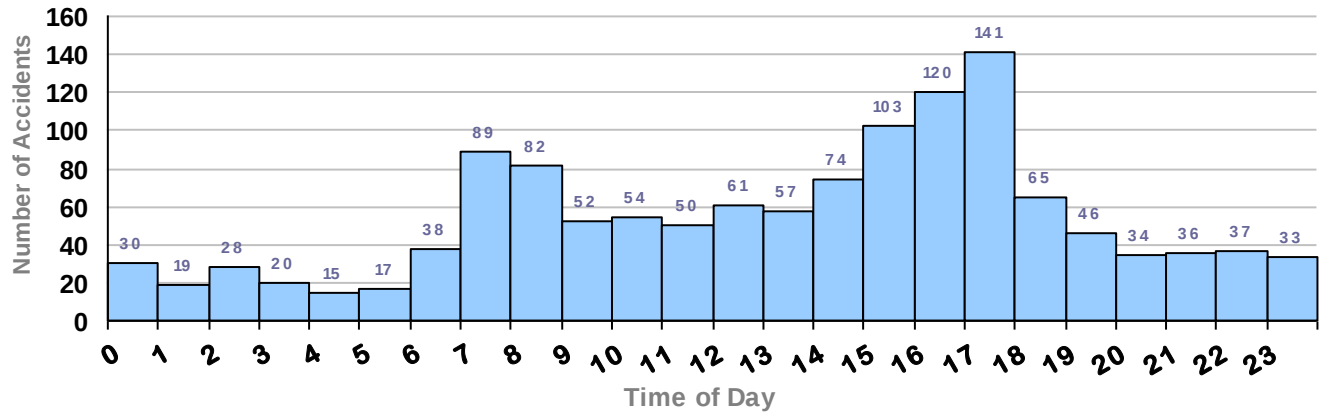
ACCIDENTS BY DAY OF WEEK



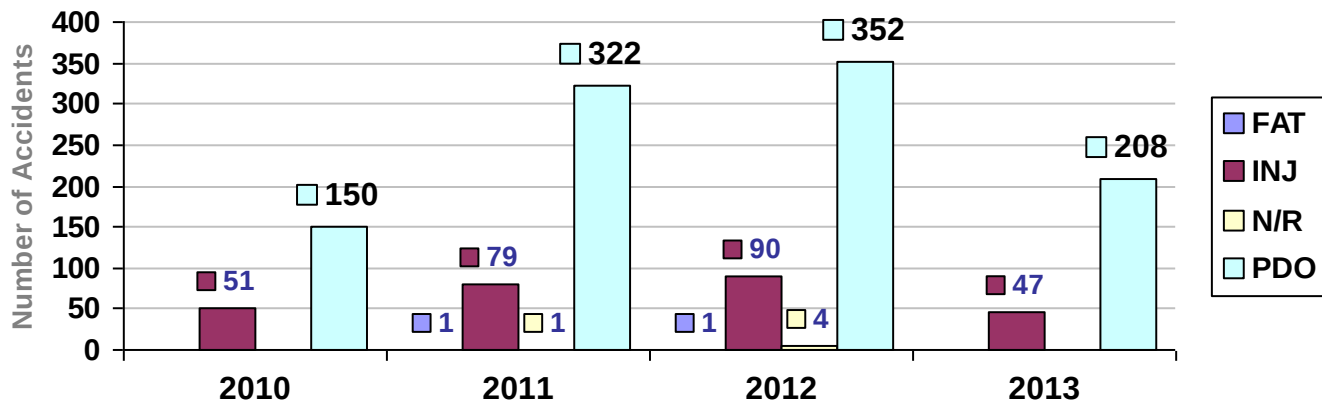
HSA CHARTS

ROUTE: 81/ LOCATION: Syracuse, New York
 TIME PERIOD COVERED: 7/1/2010 - 6/30/2013 REFERENCE MARKERS / NODES 81/ 3303 2006 - 81/ 3303 3066
 REMARKS: All Accidents DATE: 11/6/2014

ACCIDENTS BY TIME OF DAY



SEVERITY DISTRIBUTION BY YEAR



HSA CHARTS

ROUTE: 81/

LOCATION: Syracuse, New York

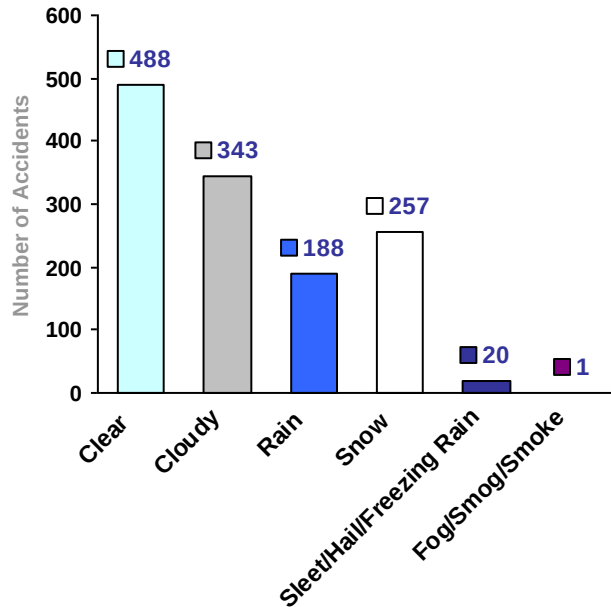
TIME PERIOD COVERED: 7/1/2010 - 6/30/2013

REFERENCE MARKERS / NODES 81/ 3303 2006 - 81/ 3303 3066

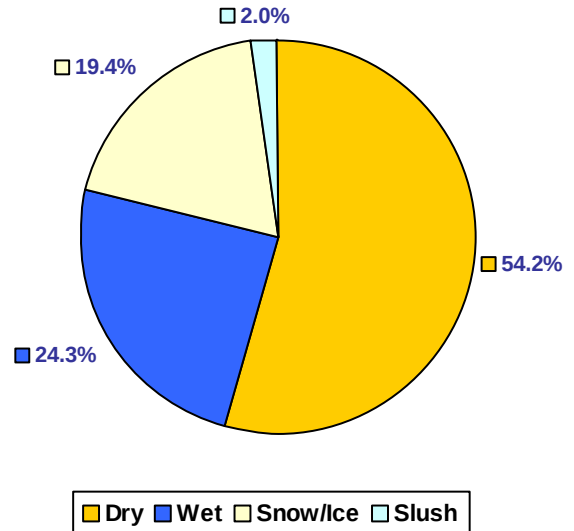
REMARKS: All Accidents

DATE: 11/6/2014

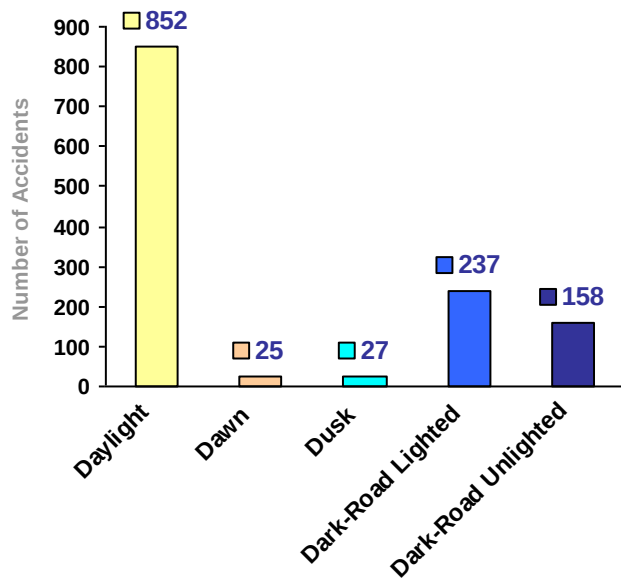
ACCIDENTS BY WEATHER



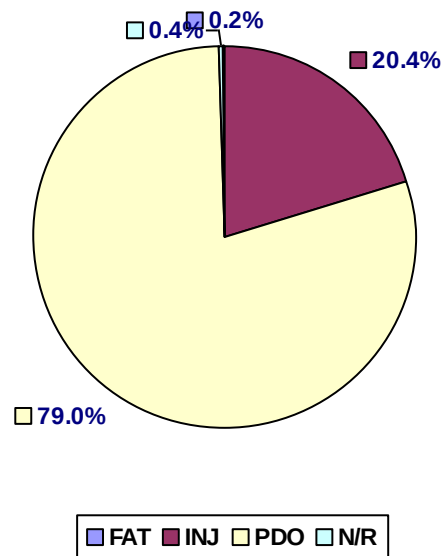
ROAD SURFACE



LIGHT CONDITION



ACCIDENT SEVERITY



Accident Summaries for I-690

ACCIDENT SUMMARY SHEET

ROUTE: 690I **LOCATION:** Syracuse, New York
MUNICIPALITY: **COUNTY:**
TIME PERIOD COVERED: 7/1/2010 - 6/30/2013 **REFERENCE MARKERS / NODES:** 690I 3301 2002 - 690I 3301 3016
REMARKS: All Accidents **DATE:** 11/6/2014

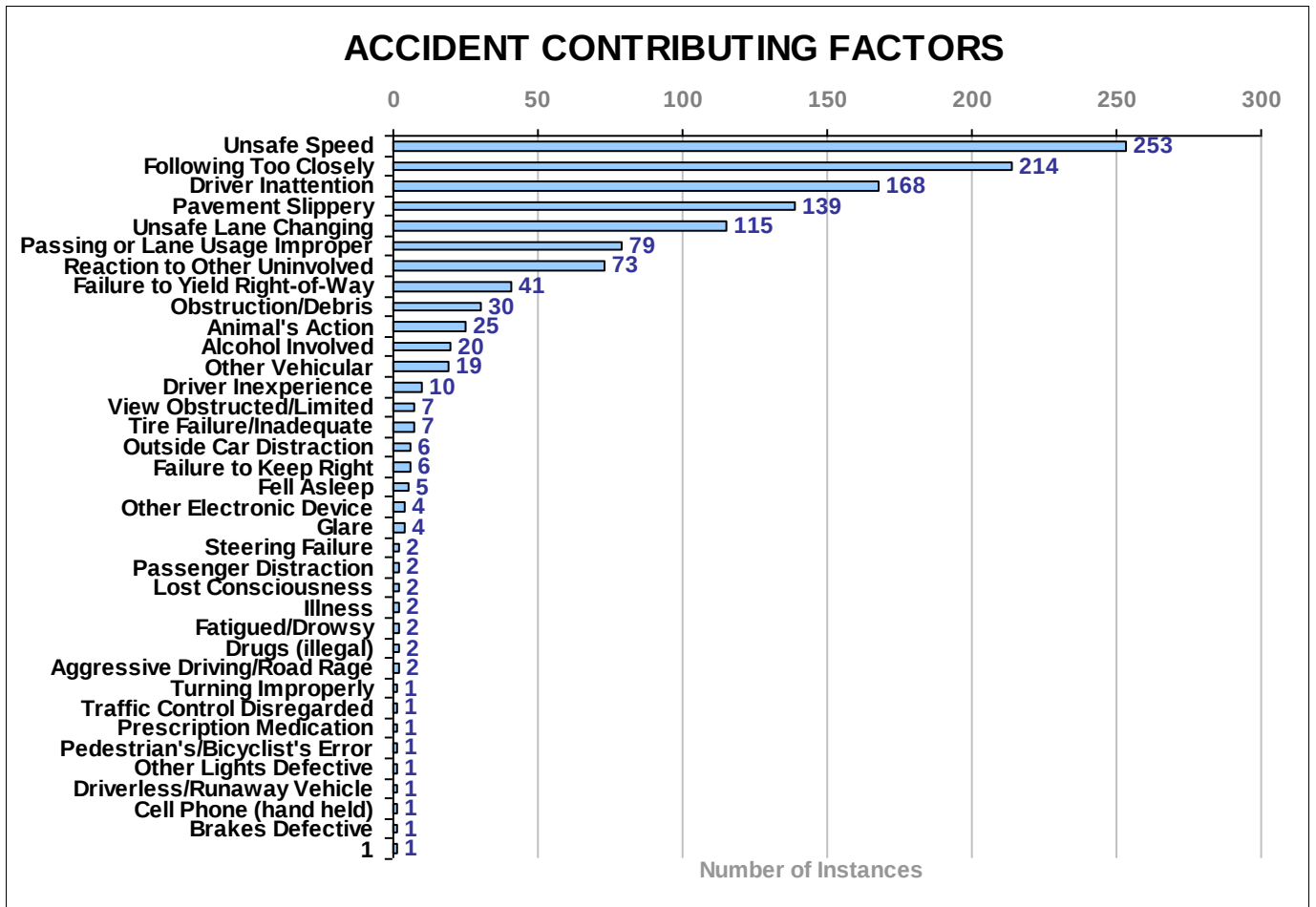
TIME OF DAY 6 AM - 10 AM 191 22.7% 10 AM - 4 PM 267 31.7% 4 PM - 7 PM 183 21.7% 7 PM - 12 AM 110 13.0% 12 AM - 6 AM 89 10.6% Unspecified 3 0.4% Total 843	DIRECTION North 0 0.0% South 0 0.0% East 727 52.3% West 663 47.7% Total 1390	DIRECTION Northeast 0 0.0% Northwest 0 0.0% Southeast 0 0.0% Southwest 0 0.0% Unspecified 0 0.0%
WEATHER Clear 310 36.8% Cloudy 222 26.3% Rain 120 14.2% Snow 165 19.6% Sleet/Hail/Freezing Rain 13 1.5% Fog/Smog/Smoke 0 0.0% Unspecified 13 1.5% Total 843	ACCIDENT TYPE Rear End 256 30.4% Overtake 183 21.7% Right Angle 6 0.7% Left Turn 0 0.0% Right Turn 0 0.0% Fixed Object 304 36.1% Head On 3 0.4% Sideswipe 0 0.0% Total 843	ACCIDENT TYPE Pedestrian 3 0.4% Bicycle 0 0.0% Parked Vehicle 0 0.0% Backing 0 0.0% Run Off The Road 18 2.1% Animal 25 3.0% Other 42 5.0% Unspecified 3 0.4%
SURFACE Dry 446 52.9% Wet 206 24.4% Mud/Slush 11 1.3% Snow/Ice 170 20.2% Unspecified 10 1.2% Total 843	ACCIDENT SEVERITY Fatal 0 0.0% Injury 175 20.8% Property Damage 665 78.9% Non-Reportable 3 0.4% Total 843	
TIME OF YEAR Winter (Dec-Feb) 292 34.6% Spring (Mar-May) 191 22.7% Summer (Jun-Aug) 180 21.4% Fall (Sep-Nov) 180 21.4% Total 843	TYPE OF VEHICLE Passenger Cars 1410 95.7% Commercial Vehicles 64 4.3% Total 1474	
DAY OF WEEK Sunday 92 10.9% Monday 108 12.8% Tuesday 137 16.3% Wednesday 152 18.0% Thursday 108 12.8% Friday 141 16.7% Saturday 105 12.5% Total 843	LIGHT CONDITION Daylight 557 66.1% Dawn/Dusk 35 4.2% Night 243 28.8% Unspecified 8 0.9% Total 843	

SUMMARY OF ACCIDENT SEVERITY BY YEAR:

	2010	2011	2012	2013
Fatal Accidents	0	0	0	0
Injury Accidents	29	65	59	22
Property Damage Accidents	104	249	205	107
Non-Reportable Accidents	2	1	0	0
Total Accidents	135	315	264	129

HSA CHARTS

ROUTE: 690I LOCATION: Syracuse, New York
 TIME PERIOD COVERED: 7/1/2010 - 6/30/2013 REFERENCE MARKERS / NODES 690I 3301 2002 - 690I 3301 3016
 REMARKS: All Accidents DATE: 11/6/2014



HSA CHARTS

ROUTE: 690I

LOCATION: Syracuse, New York

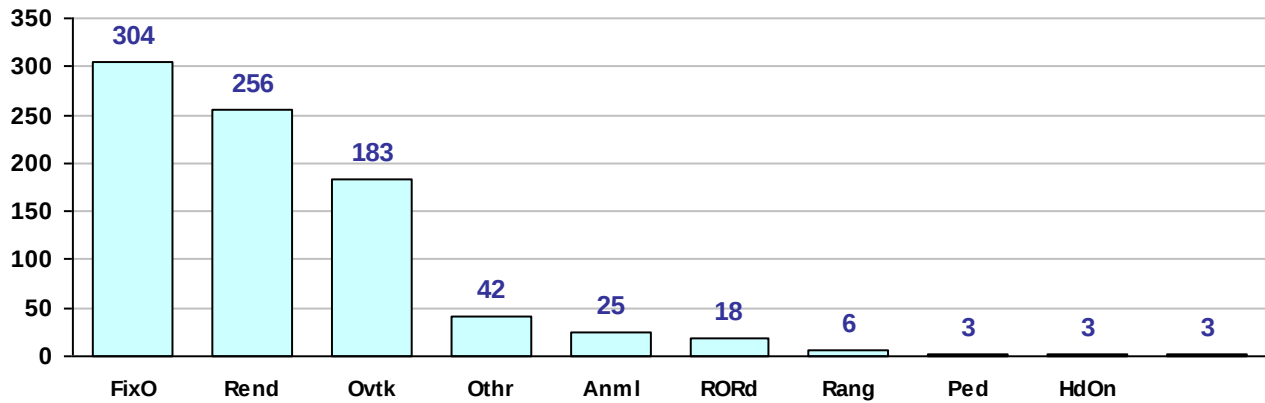
TIME PERIOD COVERED: 7/1/2010 - 6/30/2013

REFERENCE MARKERS / NODES 690I 3301 2002 - 690I 3301 3016

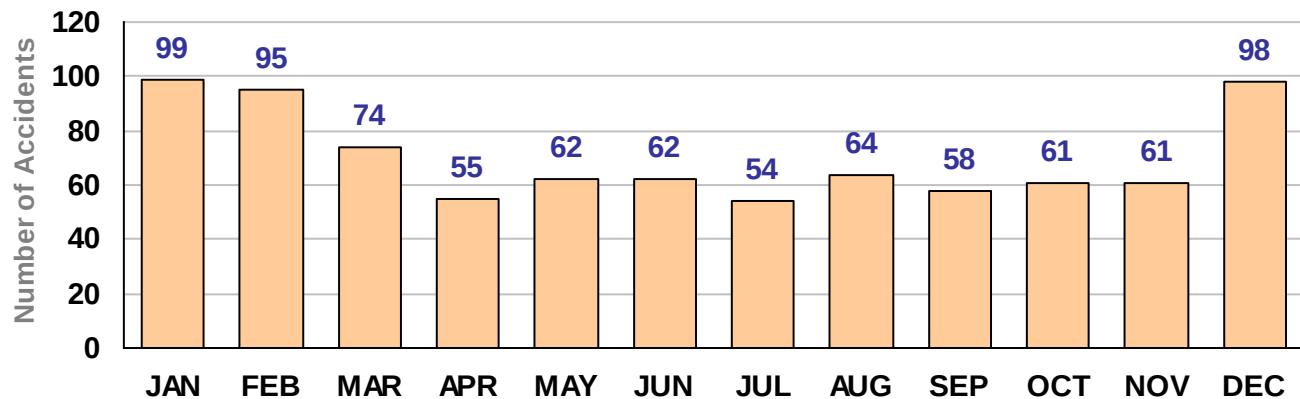
REMARKS: All Accidents

DATE: 11/6/2014

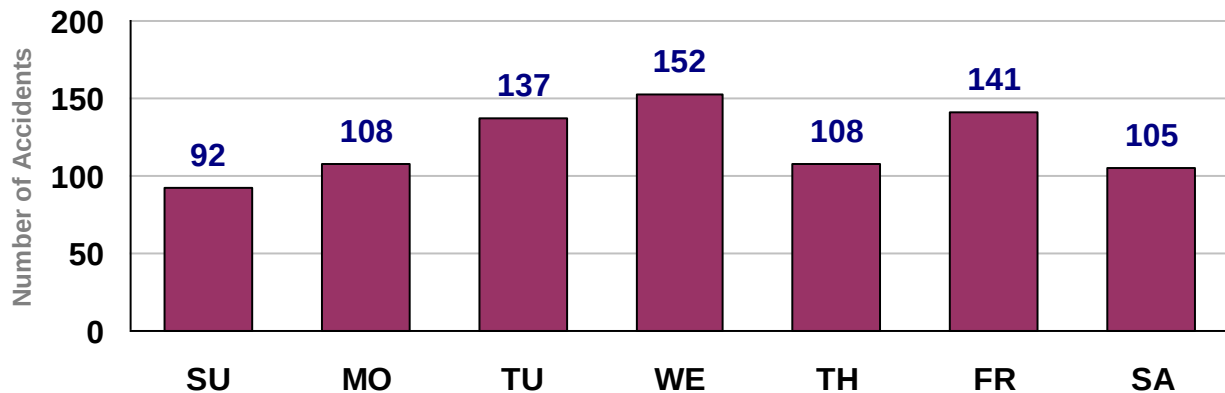
NUMBER OF ACCIDENTS BY TYPE



ACCIDENTS BY MONTH



ACCIDENTS BY DAY OF WEEK



HSA CHARTS

ROUTE: 690I

LOCATION: Syracuse, New York

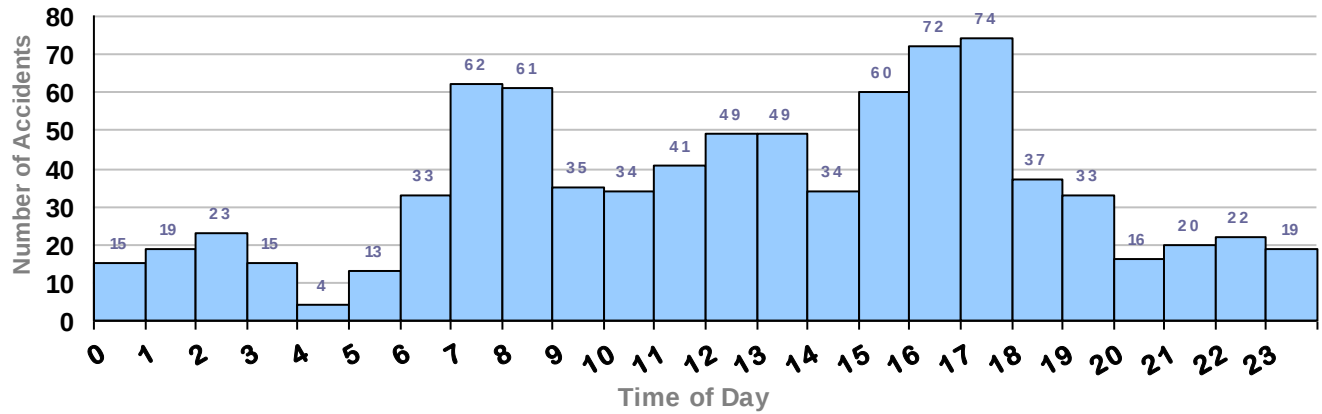
TIME PERIOD COVERED: 7/1/2010 - 6/30/2013

REFERENCE MARKERS / NODES 690I 3301 2002 - 690I 3301 3016

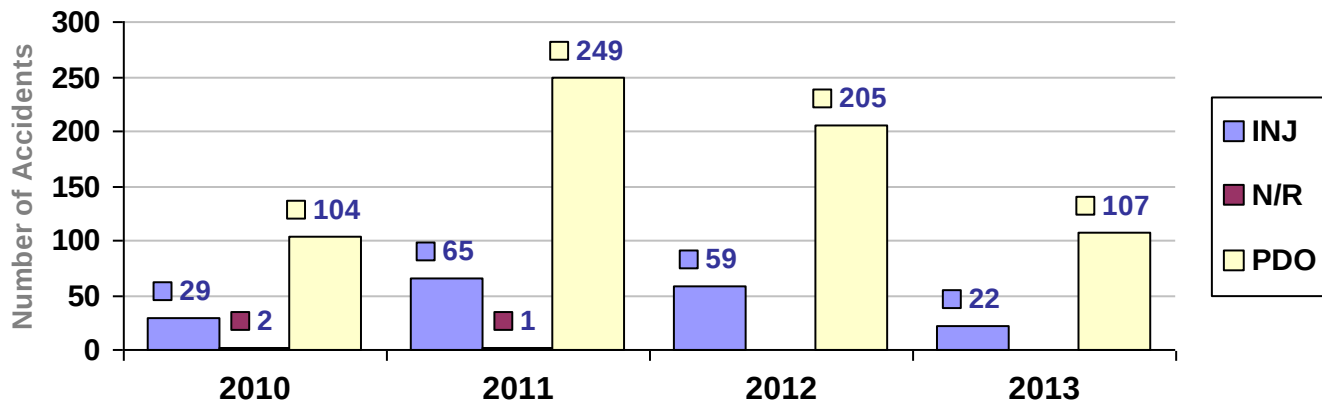
REMARKS: All Accidents

DATE: 11/6/2014

ACCIDENTS BY TIME OF DAY



SEVERITY DISTRIBUTION BY YEAR



HSA CHARTS

ROUTE: 690I

LOCATION: Syracuse, New York

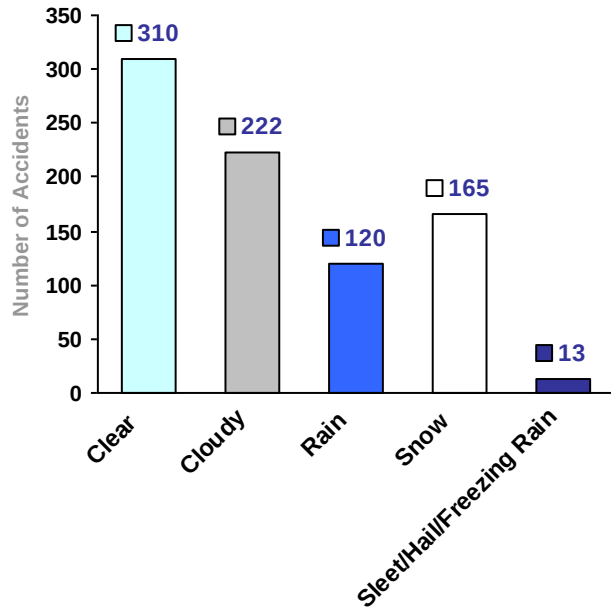
TIME PERIOD COVERED: 7/1/2010 - 6/30/2013

REFERENCE MARKERS / NODES 690I 3301 2002 - 690I 3301 3016

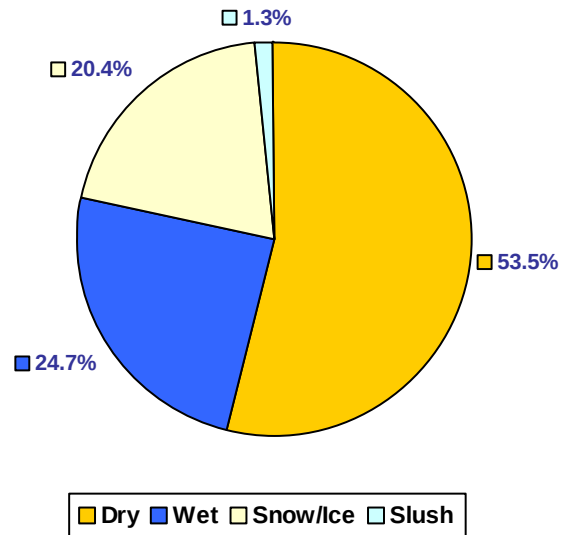
REMARKS: All Accidents

DATE: 11/6/2014

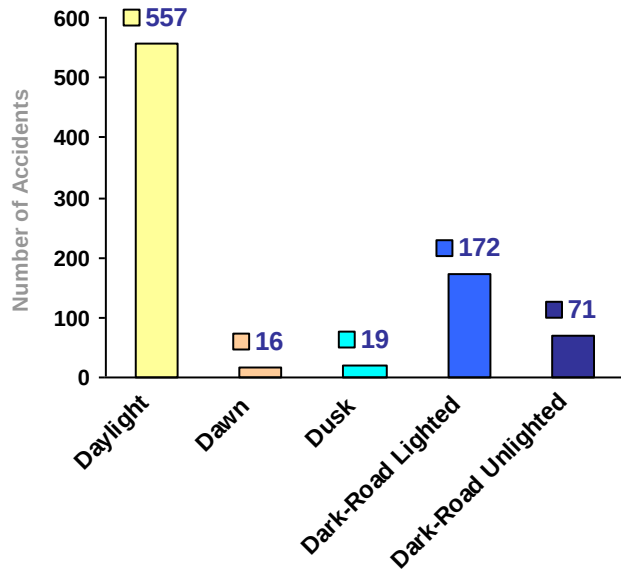
ACCIDENTS BY WEATHER



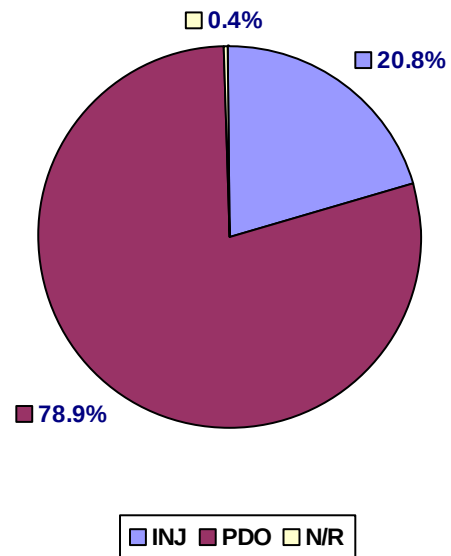
ROAD SURFACE



LIGHT CONDITION



ACCIDENT SEVERITY



Accident Summaries for I-481

ACCIDENT SUMMARY SHEET

ROUTE: I-481 **LOCATION:** Syracuse, New York
MUNICIPALITY: _____ **COUNTY:** _____
TIME PERIOD COVERED: 7/1/2010 - 6/30/2013 **REFERENCE MARKERS / NODES:** 481/ 3301 1000 - 481/ 3301 2145
REMARKS: All Accidents **DATE:** 11/6/2014

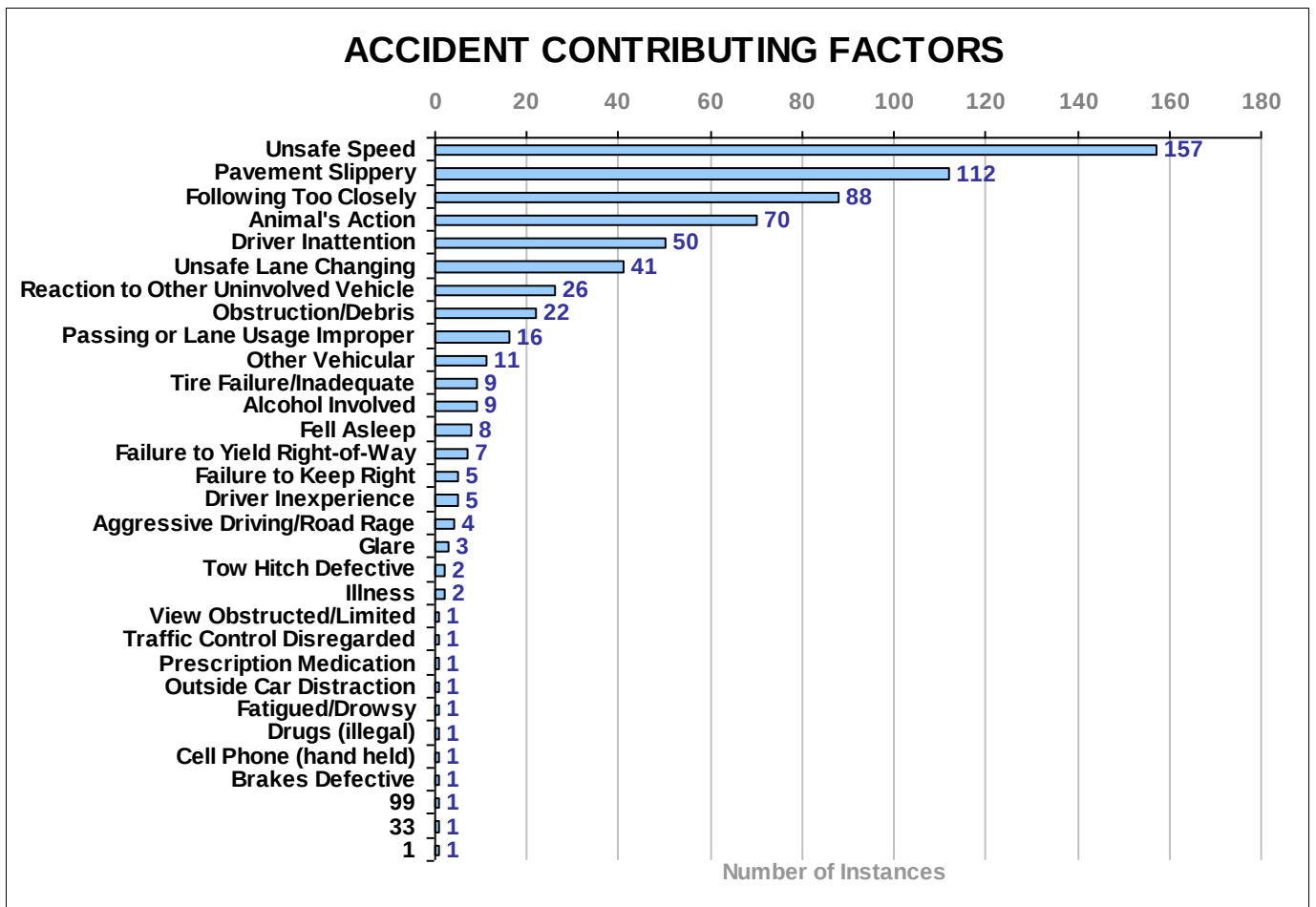
TIME OF DAY			# ACC	%	DIRECTION			# ACC					
6 AM - 10 AM			108	22.5%	North	254	37.0%	Northeast	0	0.0%			
10 AM - 4 PM			143	29.7%	South	432	63.0%	Northwest	0	0.0%			
4 PM - 7 PM			124	25.8%	East	0	0.0%	Southeast	0	0.0%			
7 PM - 12 AM			62	12.9%	West	0	0.0%	Southwest	0	0.0%			
12 AM - 6 AM			42	8.7%	Total	686	Unspecified	0	0.0%				
Unspecified			2	0.4%									
Total			481										
WEATHER			# ACC	%	ACCIDENT TYPE	# ACC	%	ACCIDENT TYPE	# ACC				
Clear			154	32.0%	Rear End	98	20.4%	Pedestrian	0	0.0%			
Cloudy			155	32.2%	Overtake	61	12.7%	Bicycle	0	0.0%			
Rain			96	20.0%	Right Angle	8	1.7%	Parked Vehicle	0	0.0%			
Snow			66	13.7%	Left Turn	0	0.0%	Backing	0	0.0%			
Sleet/Hail/Freezing Rain			6	1.2%	Right Turn	0	0.0%	Run Off The Road	23	4.8%			
Fog/Smog/Smoke			0	0.0%	Fixed Object	187	38.9%	Animal	69	14.3%			
Unspecified			4	0.8%	Head On	1	0.2%	Other	32	6.7%			
					Sideswipe	0	0.0%	Unspecified	2	0.4%			
Total			481		Total			481					
SURFACE					# ACC	%	ACCIDENT SEVERITY						
Dry					228	47.4%	Fatal					2	0.4%
Wet					159	33.1%	Injury					91	18.9%
Mud/Slush					9	1.9%	Property Damage					386	80.2%
Snow/Ice					79	16.4%	Non-Reportable					2	0.4%
Unspecified					6	1.2%	Total					481	
Total					481								
TIME OF YEAR					# ACC	%	TYPE OF VEHICLE						
Winter (Dec-Feb)					130	27.0%	Passenger Cars					697	94.6%
Spring (Mar-May)					99	20.6%	Commercial Vehicles					40	5.4%
Summer (Jun-Aug)					101	21.0%	Total					737	
Fall (Sep-Nov)					151	31.4%							
Total					481								
DAY OF WEEK					# ACC	%	LIGHT CONDITION						
Sunday					45	9.4%	Daylight					316	65.7%
Monday					61	12.7%	Dawn/Dusk					29	6.0%
Tuesday					76	15.8%	Night					132	27.4%
Wednesday					78	16.2%	Unspecified					4	0.8%
Thursday					62	12.9%	Total					481	
Friday					93	19.3%							
Saturday					66	13.7%							
Total					481								

SUMMARY OF ACCIDENT SEVERITY BY YEAR:

	2010	2011	2012	2013
Fatal Accidents	1	0	0	1
Injury Accidents	12	40	24	15
Property Damage Accidents	74	133	128	51
Non-Reportable Accidents	0	1	1	0
Total Accidents	87	174	153	67

HSA CHARTS

ROUTE: 481I LOCATION: Syracuse, New York
 TIME PERIOD COVERED: 7/1/2010 - 6/30/2013 REFERENCE MARKERS / NODES 481I 3301 1000 - 481I 3301 2145
 REMARKS: All Accidents DATE: 11/6/2014



HSA CHARTS

ROUTE: I-481

LOCATION: Syracuse, New York

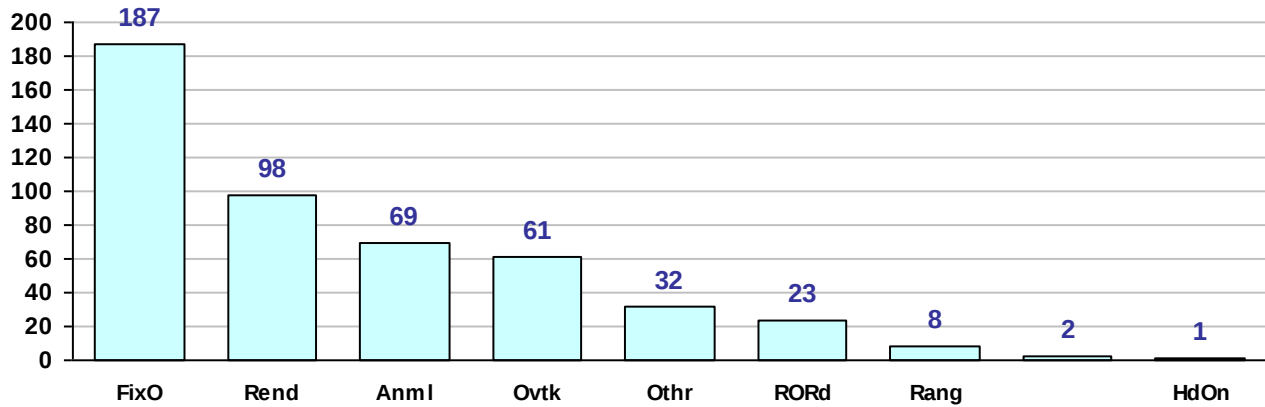
TIME PERIOD COVERED: 7/1/2010 - 6/30/2013

REFERENCE MARKERS / NODES 481/ 3301 1000 - 481/ 3301 2145

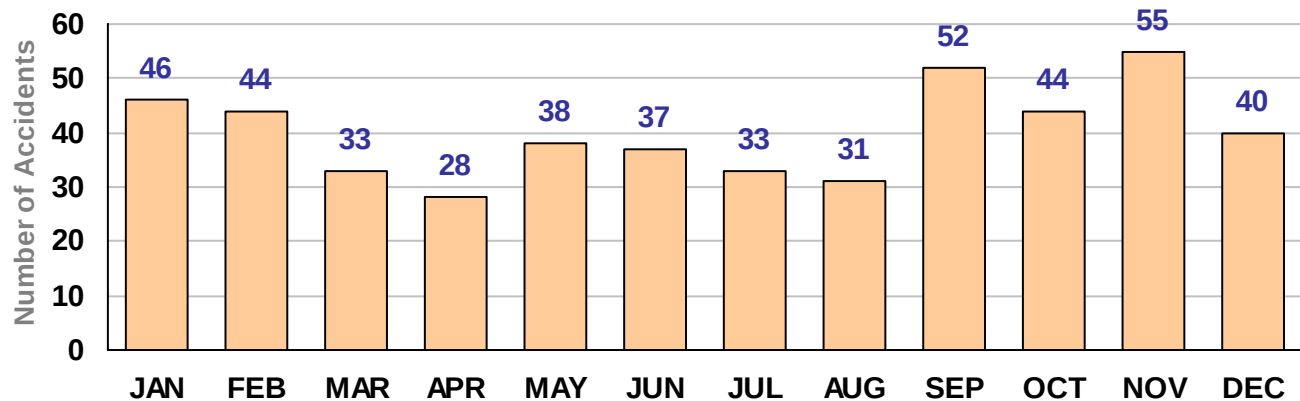
REMARKS: All Accidents

DATE: 11/6/2014

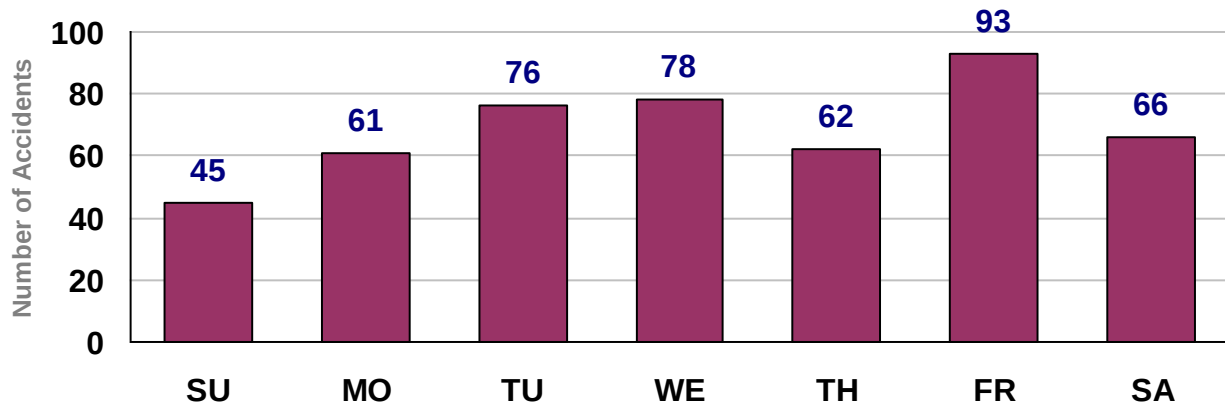
NUMBER OF ACCIDENTS BY TYPE



ACCIDENTS BY MONTH



ACCIDENTS BY DAY OF WEEK



HSA CHARTS

ROUTE: I-481

LOCATION: Syracuse, New York

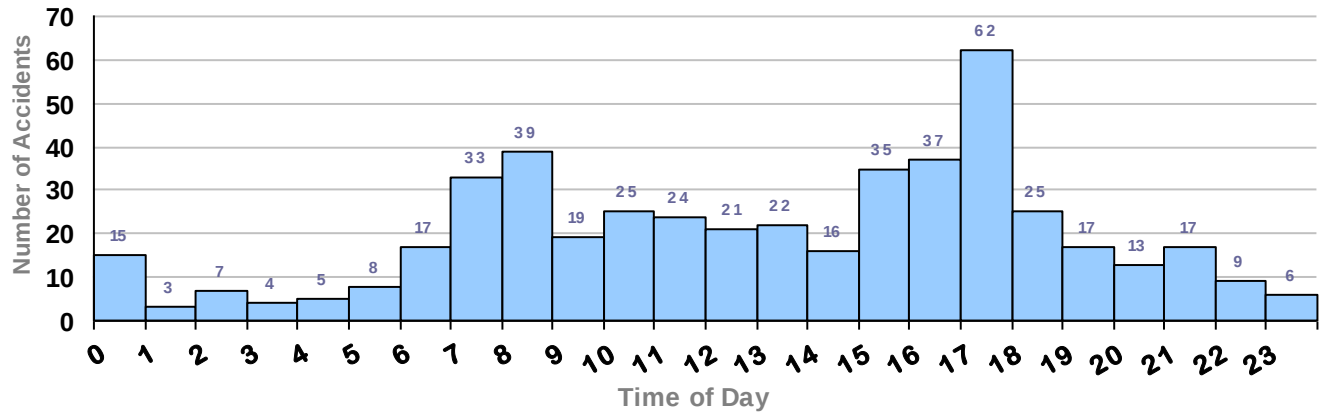
TIME PERIOD COVERED: 7/1/2010 - 6/30/2013

REFERENCE MARKERS / NODES 481/ 3301 1000 - 481/ 3301 2145

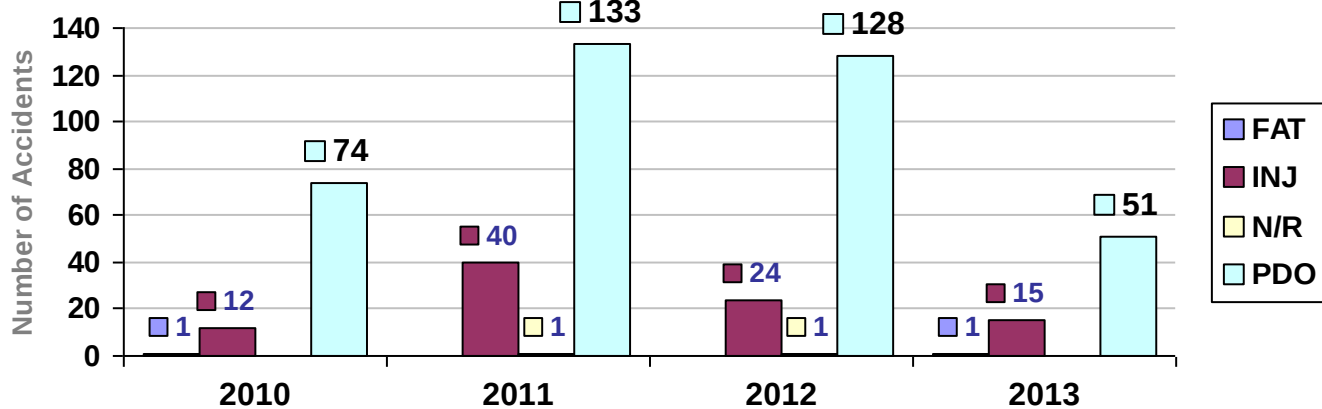
REMARKS: All Accidents

DATE: 11/6/2014

ACCIDENTS BY TIME OF DAY



SEVERITY DISTRIBUTION BY YEAR



HSA CHARTS

ROUTE: I-481

LOCATION: Syracuse, New York

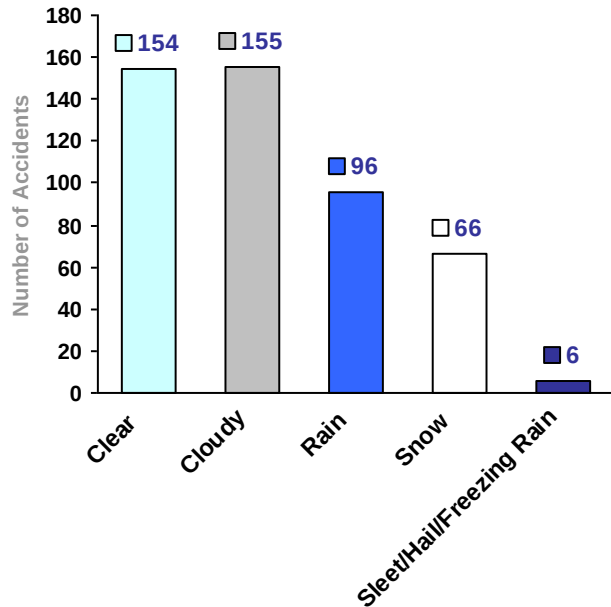
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REFERENCE MARKERS / NODES 481/ 3301 1000 - 481/ 3301 2145

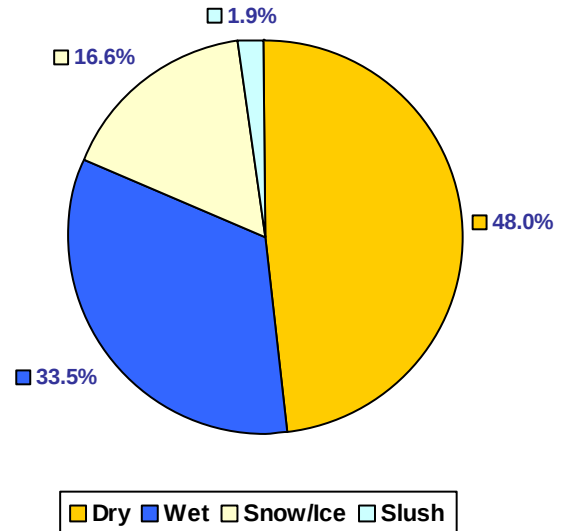
REMARKS: All Accidents

DATE: 11/6/2014

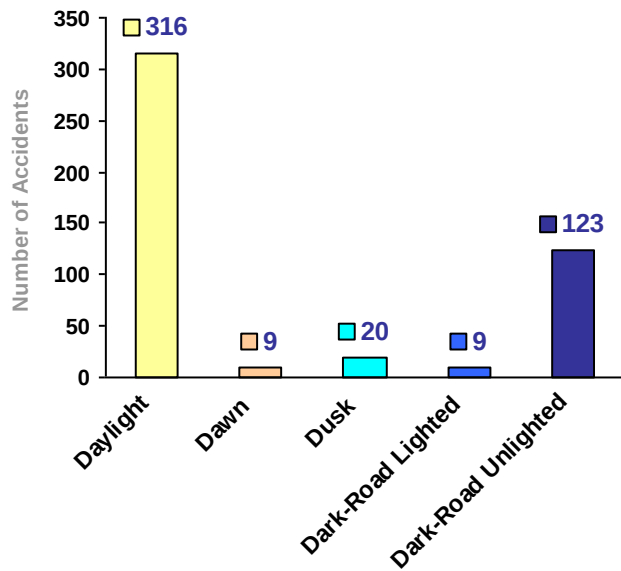
ACCIDENTS BY WEATHER



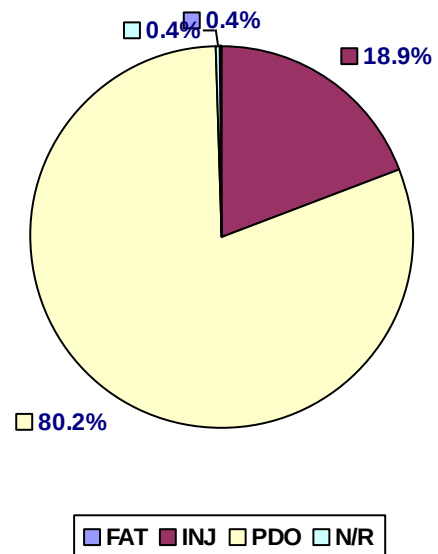
ROAD SURFACE



LIGHT CONDITION



ACCIDENT SEVERITY



Safety Analysis Related to Nonstandard and Nonconforming Features

I-81/I-690 S-Curve and Slalom Area

I-81 Viaduct Project – Syracuse, New York

Non-Standard and Non-Conforming Features Evaluation S-Curve and Slalom Area

Introduction

The I-81 viaduct “S-curve and slalom area” comprises the area approaching/through the I-81/I-690 interchange. It includes I-81 from Interchange 17 near Colvin Street (south of downtown) to Interchange 25 at 7th N. Street (north of downtown) and I-690 from Interchange 9 in the vicinity of Hiawatha Boulevard (near the fairgrounds) to west of Interchange 15 near Peat Street (northeast of Syracuse University). The area includes I-81 reference marker (RM) 81I 3303 2029 to RM 81I 3303 3008 in both the northbound and southbound directions and I-690 RM 690I 3301 2009 to RM 690I 3301 2046 in both the eastbound and westbound directions. See Figure 1 for a map of the general study area.

There are many non-standard and non-conforming geometric design features in the S-curve and slalom area. The non-standard features, along with reference marker locations (referred to from this point on by the last four digits), are provided in Figure 2. Figure 2A shows areas with non-standard shoulder widths, median widths, and stopping sight distances, while Figure 2B shows areas with non-standard curve radii, superelevations, and grades. These non-standard features, as well as additional non-conforming acceleration/deceleration lengths and ramp-to-ramp spacings, were identified in a previously-conducted planning study of the I-81 viaduct area and were spot-checked for accuracy in the field for this project. The purpose of the following preliminary accident investigation is to identify the level of correlation between accidents in the I-81 viaduct S-curve and slalom area to existing non-standard/non-conforming design features.

Accident data for the I-81 viaduct project was provided by NYSDOT for the most recent available three-year period (from July 1, 2010 through June 30, 2013). There were 1,489 accidents (903 along I-81 and 586 along I-690) initially coded to the S-curve and slalom area during the analysis period. Upon review of the accident data for this and other critical I-81 viaduct project area locations, 1,354 accidents were found to have actually occurred in the S-curve and slalom area – 817 on I-81 between RM 2029 and RM 3008 and 537 on I-690 between RM 2009 and RM 2046. Of these, 1,299 accidents (776 along I-81 and 523 along I-690) could be located, and 55 accidents (41 along I-81 and 14 along I-690) had reference markers unknown. Graphs of the total number of known accidents at individual reference markers along I-81 and I-690 (both applicable travel directions combined) are provided in Figures 3 and 4, respectively. Graphs were also developed for the total number of known accidents for 0.3-mile segments of I-81 and I-690 (both applicable travel directions combined), as shown in Figures 5 and 6, respectively. The latter allowed comparisons to be made between study area accident numbers and NYSDOT Region 3 High Accident Location (HAL) thresholds. As noted in the figures, a roadway segment in Region 3 (Syracuse) must be a minimum of 0.3-mile (i.e., three adjacent reference markers long) and experience a total of 9 accidents per year (i.e., 27 total for this three-year analysis period) to qualify as an urban Priority Investigation Location (PIL).

Based on an examination of the non-standard/non-conforming feature locations and an identification of potential PILs, the S-curve and slalom study area was modified to focus on reference markers with non-standard/non-conforming design features and/or relatively high accident numbers. The modified study area includes I-81 between RM 2032 and RM 2166 and I-690 between RM 2014 and RM 2042.

Non-Standard/Non-Conforming Features Study Area Analysis

A non-standard/non-conforming features analysis was conducted for the modified S-curve and slalom area study area – I-81 between RM 2032 and RM 2166 and I-690 between RM 2014 and RM 2042. A total of 1,181 accidents occurred in this area during the three-year accident analysis period – 695 along I-81 and 486 along I-690. However, as shown in Figure 2, non-standard and non-conforming features may differ by direction, and some combinations of reference markers and directions do not have any non-standard or non-conforming features. Therefore, 1,087 accidents in the S-curve and slalom area were identified to be potentially related to non-standard/non-conforming design features; these included 658 accidents along I-81 (341 in the northbound direction and 317 in the southbound direction) and 429 accidents along I-690 (232 in the eastbound direction and 197 in the westbound direction). The police report for each of these accidents was examined in detail to determine if the accident could be attributed in any way to a non-standard/non-conforming feature.

As shown in Table 1, typically fewer than half of the accidents along I-81 and fewer than one-third of the accidents along I-690 were likely attributable to non-standard and/or non-conforming features. Instead, many accidents occurred in construction zones and/or involved debris, animals, severe rainy/snowy/icy conditions, driver error or other factors. The correlations of accidents to non-standard/non-conforming features by individual I-81 and I-690 reference markers are provided in Figures 7 and 8, respectively. Along I-81, there may be a higher proportion of accidents related to non-standard and/or non-conforming features in the RM 2042 to RM 2161 area. Along I-690, there are pockets along the length of the eastbound direction that may have relatively high numbers of accidents related to non-standard and/or non-conforming features, while the only concentration of accidents that may be related to non-standard/non-conforming features in the westbound direction is from RM 2023 to RM 2025. It should be noted that both “Yes” and “Unknown” accidents were considered potentially related to non-standard/non-conforming features, as the major contributing factors for the “Unknowns” could not be determined from accident reports, and therefore could not be eliminated from further consideration in the evaluation.

**Table 1 – Number of S-Curve and Slalom Area Accidents
Correlated to Non-Standard/Non-Conforming Features**

I-81 (RM 2032 to RM 2166)

<u>Southbound</u>			<u>Northbound</u>		
No	176	55%	No	170	50%
Yes	91	29%	Yes	118	34%
Unknown	50	16%	Unknown	53	16%
Total	317		Total	341	

I-690 (RM 2014 to RM 2042)

<u>Westbound</u>			<u>Eastbound</u>		
No	162	82%	No	151	65%
Yes	14	7%	Yes	44	19%
Unknown	21	11%	Unknown	37	16%
Total	197		Total	232	

Evaluation of Viaduct Alternatives and Retention of Non-Standard Features

During the three-year analysis period from July 1, 2010 through June 30, 2013, 177 accidents occurred in the I-81 curve segment – of which 125 (71 percent) were identified to be potentially related to non-standard/non-conforming features. 54 accidents (43 percent) were primarily related to non-conforming ramp spacing, 52 accidents (42 percent) to non-standard curve radii, 11 (9 percent) to non-conforming acceleration/deceleration lanes, and 1 (1 percent) to non-standard shoulders. These accidents (which comprise 95 percent of the accidents related to non-standard/non-conforming features) would be less likely to occur in the future, since the corresponding non-standard/non-conforming features would be eliminated. Only 7 accidents (5 percent) were found to be related to non-standard sight distance. For the Viaduct Alternative, the sight distance would be improved by 62 to 88 percent and to within 77 to 89 percent of standards. It is anticipated that there would be some reduction in accidents associated with the improvements to sight distance.

During the three-year analysis period, 98 accidents occurred in the I-690 curve segment – of which 41 (42 percent) were identified to be potentially related to non-standard/non-conforming features. As indicated in Table 2, 17 accidents (41 percent) were related to non-conforming ramp spacing, 8 accidents (20 percent) to non-standard curve radius, 5 (12 percent) to non-conforming acceleration/deceleration lanes, and 1 (2 percent) to non-standard shoulders. These accidents (which comprise 75 percent of the accidents related to non-standard/non-conforming features) would be eliminated, since the corresponding non-standard/non-conforming features would be eliminated. Ten accidents (25 percent) were found to be related to non-standard sight distance. For the Viaduct Alternative, the sight distance would be improved by 38 to 70 percent and to within 77 to 89 percent of standard. It is anticipated that there would be some reduction in accidents associated with the improvements to sight distance.

Conclusion

There are many locations in the S-curve and slalom area with existing non-standard and non-conforming features. However, based on a detailed examination of accident reports in the greater I-81 at I-690 interchange area, the proportion of accidents that are related to the non-standard/non-conforming features is relatively small. There were 312 accidents (47 percent) along I-81 between RM 2032 and RM 2166 that were identified to be potentially related to non-standard/non-conforming geometric features, and there were 116 accidents (27 percent) along I-690 between RM 2014 and RM 2042 that were identified to be potentially related. With the proposed alternatives to minimize property impacts in the I-81 viaduct project area, all non-standard/non-conforming features other than horizontal stopping sight distance would be eliminated, which would substantially reduce the 428 accidents identified above. Only 7 (5 percent) of the accidents on I-81 between RM 2043 and RM 2049 and 10 (25 percent) of the accidents on I-690 between RM 2025 and RM 2028 (i.e., along the curves in the immediate interchange area where non-standard HSSD would be retained) were identified to be potentially related to HSSD. In the Viaduct alternative design, HSSD would be improved substantially from existing conditions and would only be non-standard in the inside travel lanes. Therefore, it is expected that the Viaduct alternative would improve safety in the S-curve area.

Table 2 – Non-Standard and Non-Conforming Features Analysis and Design Improvements for the Viaduct Alternative

I-81

I = Existing Non-standard/Non-conforming feature is improved
E = Existing Non-standard/Non-conforming feature is eliminated

Curve 1 (I-81 Northbound, Curve to West)

Reference Marker	Accidents Related to Potential Non-Standard/Non-Conforming Feature?				How Many Accidents Were Related to Each Non-Standard/Non-Conforming Feature?								Horizontal Stopping Sight Distance (HSSD)				
					Design Status of Non-Standard/Non-Conforming Feature?								Existing	Standard (60 mph)	Viaduct Alternative		
	N(o)	Y(es)	U(nknown)	Y/U	Shoulder	Median	Sight Distance	Curve Radius	Super-elevation	Grade	Accel/Decel Length	Ramp Spacing			Proposed	Increase over Existing	Percent of Standard
2043	5	21	3	24	0		0	0			0	24	270	570	438	62%	77%
					E		I	E			E	E					
2044	3	8	3	11	0		0	4			0	7					
					E		I	E			E	E					
2045	5	4	3	7	0		0	7									
					E		I	E									
2046	3	8	0	8	0		1	7					270	570	438	62%	77%
					E		I	E									
Total	16	41	9	50	0	0	1	18	0	0	0	31					

Curve 2 (I-81 Northbound, Curve to North)

Reference Marker	Accidents Related to Potential Non-Standard/Non-Conforming Feature?				How Many Accidents Were Related to Each Non-Standard/Non-Conforming Feature?								Horizontal Stopping Sight Distance (HSSD)				
					Design Status of Non-Standard/Non-Conforming Feature?								Existing	Standard (60 mph)	Viaduct Alternative		
	N(o)	Y(es)	U(nknown)	Y/U	Shoulder	Median	Sight Distance	Curve Radius	Super-elevation	Grade	Accel/Decel Length	Ramp Spacing			Proposed	Increase over Existing	Percent of Standard
2047	3	2	0	2	0		0	2					270	570	445	65%	78%
					E		I	E									
2048	5	7	0	7	0		0	7		0							
					E		I	E		E							
2049	8	15	3	18	1		1	9	0	0		7					
					E		I	E	E	E		E					
Total	16	24	3	27	1	0	1	18	0	0	0	7					

Curve 3 (I-81 Southbound, Curve to East)

Reference Marker	Accidents Related to Potential Non-Standard/Non-Conforming Feature?				How Many Accidents Were Related to Each Non-Standard/Non-Conforming Feature?								Horizontal Stopping Sight Distance (HSSD)				
					Design Status of Non-Standard/Non-Conforming Feature?								Existing	Standard (60 mph)	Viaduct Alternative		
	N(o)	Y(es)	U(nknown)	Y/U	Shoulder	Median	Sight Distance	Curve Radius	Super-elevation	Grade	Accel/Decel Length	Ramp Spacing			Proposed	Increase over Existing	Percent of Standard
2047	1	1	1	2	0		0	2					270	570	507	88%	89%
					E		I	E									
2048	1	2	1	3	0		0	3									
					E		I	E									
2049	7	9	1	10	0		1	3	0	0	6						
					E		I	E	E	E	E						
Total	9	12	3	15	0	0	1	8	0	0	6	0					

Curve 4 (I-81 Southbound, Curve to South)

Reference Marker	Accidents Related to Potential Non-Standard/Non-Conforming Feature?				How Many Accidents Were Related to Each Non-Standard/Non-Conforming Feature?								Horizontal Stopping Sight Distance (HSSD)				
					Design Status of Non-Standard/Non-Conforming Feature?								Existing	Standard (60 mph)	Viaduct Alternative		
	N(o)	Y(es)	U(nknown)	Y/U	Shoulder	Median	Sight Distance	Curve Radius	Super-elevation	Grade	Accel/Decel Length	Ramp Spacing			Proposed	Increase over Existing	Percent of Standard
2043	7	7	2	9	0		1	0				8	280	570	443	58%	78%
					E		I	E				E					
2044	0	6	0	6	0		0				0	6					
					E		I				E	E					
2045	0	14	0	14	0		3	4			5	2					
					E		I	E			E	E					
2046	4	4	0	4	0		0	4					280	570	443	58%	78%
					E		I	E									
Total	11	31	2	33	0	0	4	8	0	0	5	16					

I-690

Curve 5 (I-690 Eastbound, Curve to South)

Reference Marker	Accidents Related to Potential Non-Standard/Non-Conforming Feature?				How Many Accidents Were Related to Each Non-Standard/Non-Conforming Feature?								Horizontal Stopping Sight Distance (HSSD)				
					Design Status of Non-Standard/Non-Conforming Feature?								Existing	Standard (60 mph)	Viaduct Alternative		
	N(o)	Y(es)	U(nknown)	Y/U	Shoulder	Median	Sight Distance	Curve Radius	Super- elevation	Grade	Accel/Decel Length	Ramp Spacing			Proposed	Increase over Existing	Percent of Standard
2023	4	6	0	6				1			5		290	570	445	53%	78%
								E			E						
2024	3	1	0	1			1	0			0						
							I	E			E						
2025	2	2	0	2	0		2	0	0								
					E		I	E	E								
Total	9	9	0	9	0	0	3	1	0	0	5	0					

Curve 6 (I-690 Eastbound, Curve to East)

Reference Marker	Accidents Related to Potential Non-Standard/Non-Conforming Feature?				How Many Accidents Were Related to Each Non-Standard/Non-Conforming Feature?								Horizontal Stopping Sight Distance (HSSD)				
					Design Status of Non-Standard/Non-Conforming Feature?								Existing	Standard (60 mph)	Viaduct Alternative		
	N(o)	Y(es)	U(nknown)	Y/U	Shoulder	Median	Sight Distance	Curve Radius	Super- elevation	Grade	Accel/Decel Length	Ramp Spacing			Proposed	Increase over Existing	Percent of Standard
2025	2	2	0	2	0		2	0	0				300	570	509	70%	89%
					E		I	E	E								
2026	2	1	1	2	0		0	2	0								
					E		I	E	E								
2027	10	7	2	9	1		3	5	0								
					E		I	E	E								
2028	13	2	0	2	0		2										
					E		I										
Total	27	12	3	15	1	0	7	7	0	0	0	0					

Curve 7 (I-690 Westbound, Curve to West)

Reference Marker	Accidents Related to Potential Non-Standard/Non-Conforming Feature?				How Many Accidents Were Related to Each Non-Standard/Non-Conforming Feature?								Horizontal Stopping Sight Distance (HSSD)				
					Design Status of Non-Standard/Non-Conforming Feature?								Existing	Standard (60 mph)	Viaduct Alternative		
	N(o)	Y(es)	U(nknown)	Y/U	Shoulder	Median	Sight Distance	Curve Radius	Super- elevation	Grade	Accel/Decel Length	Ramp Spacing			Proposed	Increase over Existing	Percent of Standard
2023	3	4	2	6	0		0					6	320	570	441	38%	77%
					E		I					E					
2024	4	1	4	5	0		0					5					
					E		I					E					
2025	14	3	3	6	0		0	0	0			6					
					E		I	E	E			E					
Total	21	8	9	17	0	0	0	0	0	0	0	17					

Figures

Figure 1 – S-Curve and Slalom Study Area

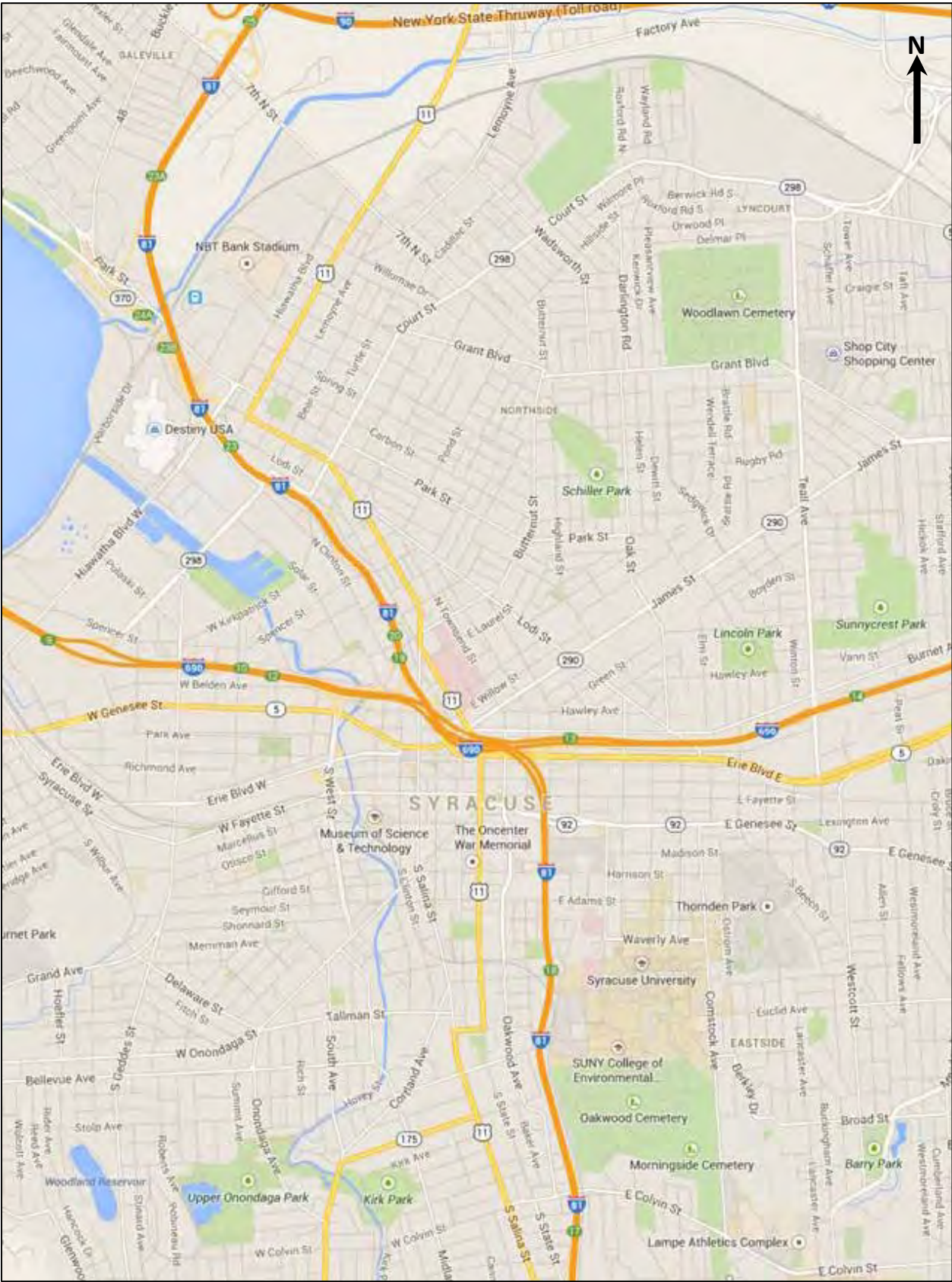
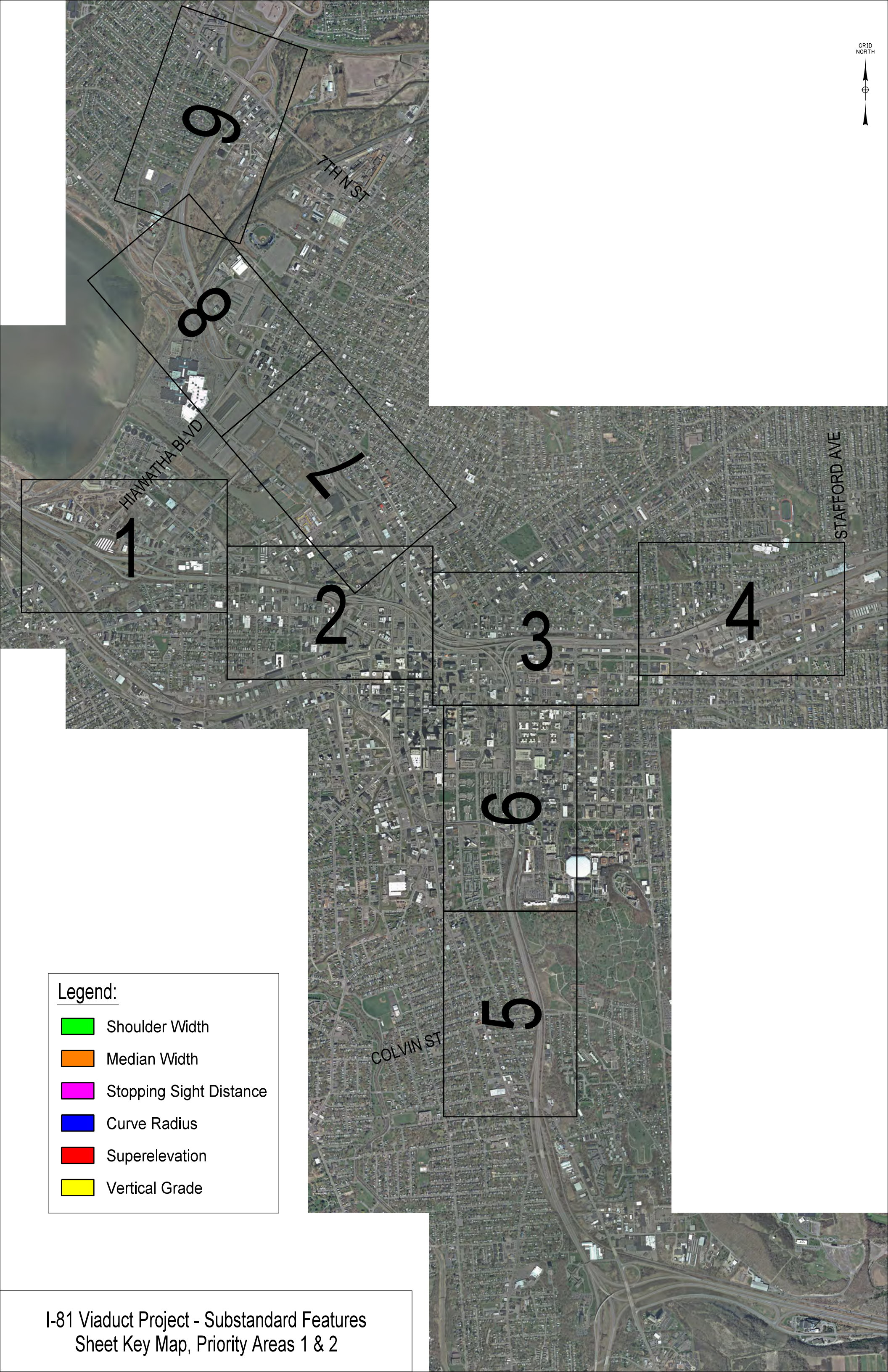


Figure 2

I-81 Viaduct Project – Non-Standard Features Key Map



Legend:

- Shoulder Width
- Median Width
- Stopping Sight Distance
- Curve Radius
- Superelevation
- Vertical Grade

Figure 2A

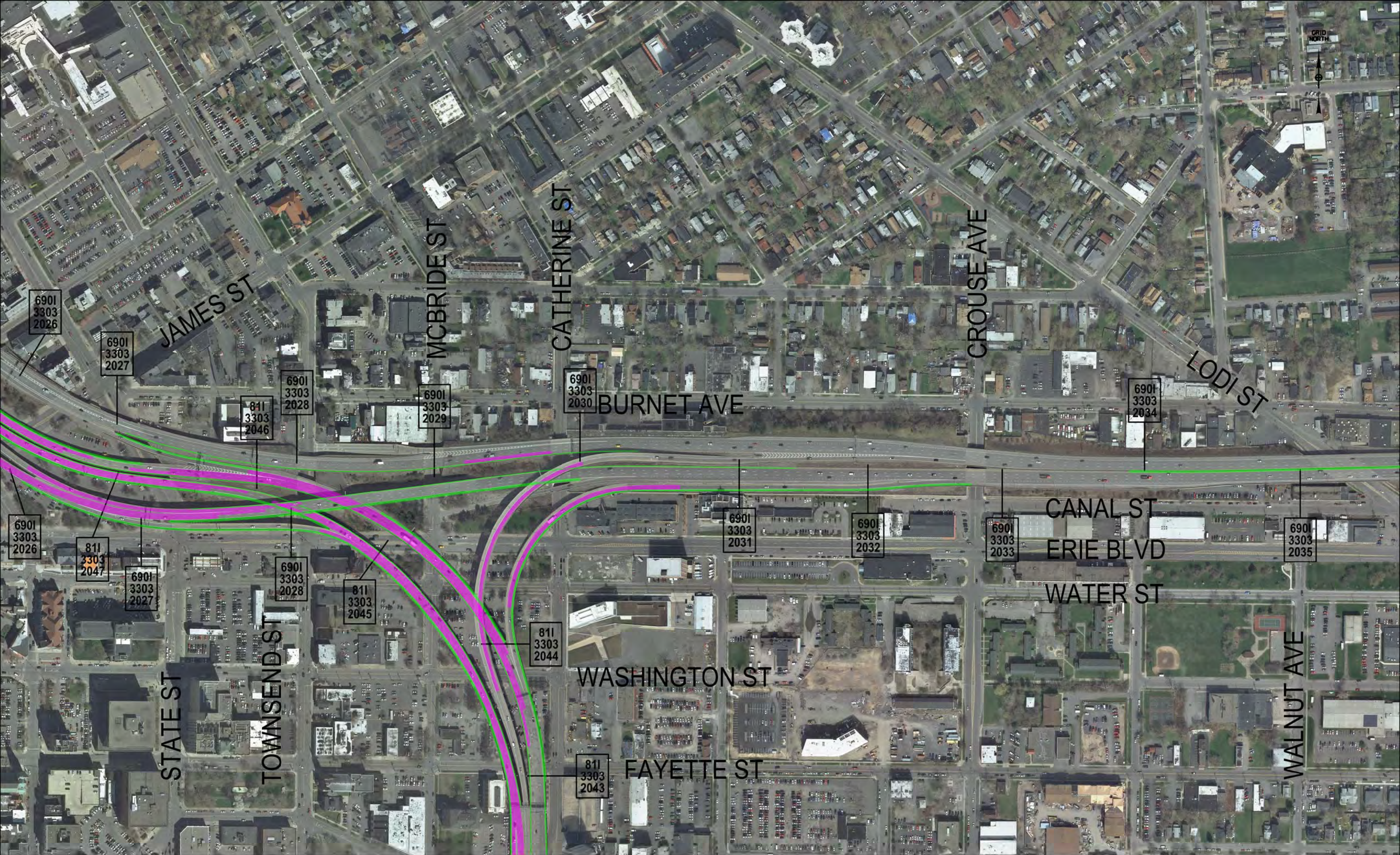
I-81 Viaduct Project – Non-Standard Shoulder, Median Width, and Stopping Sight Distance

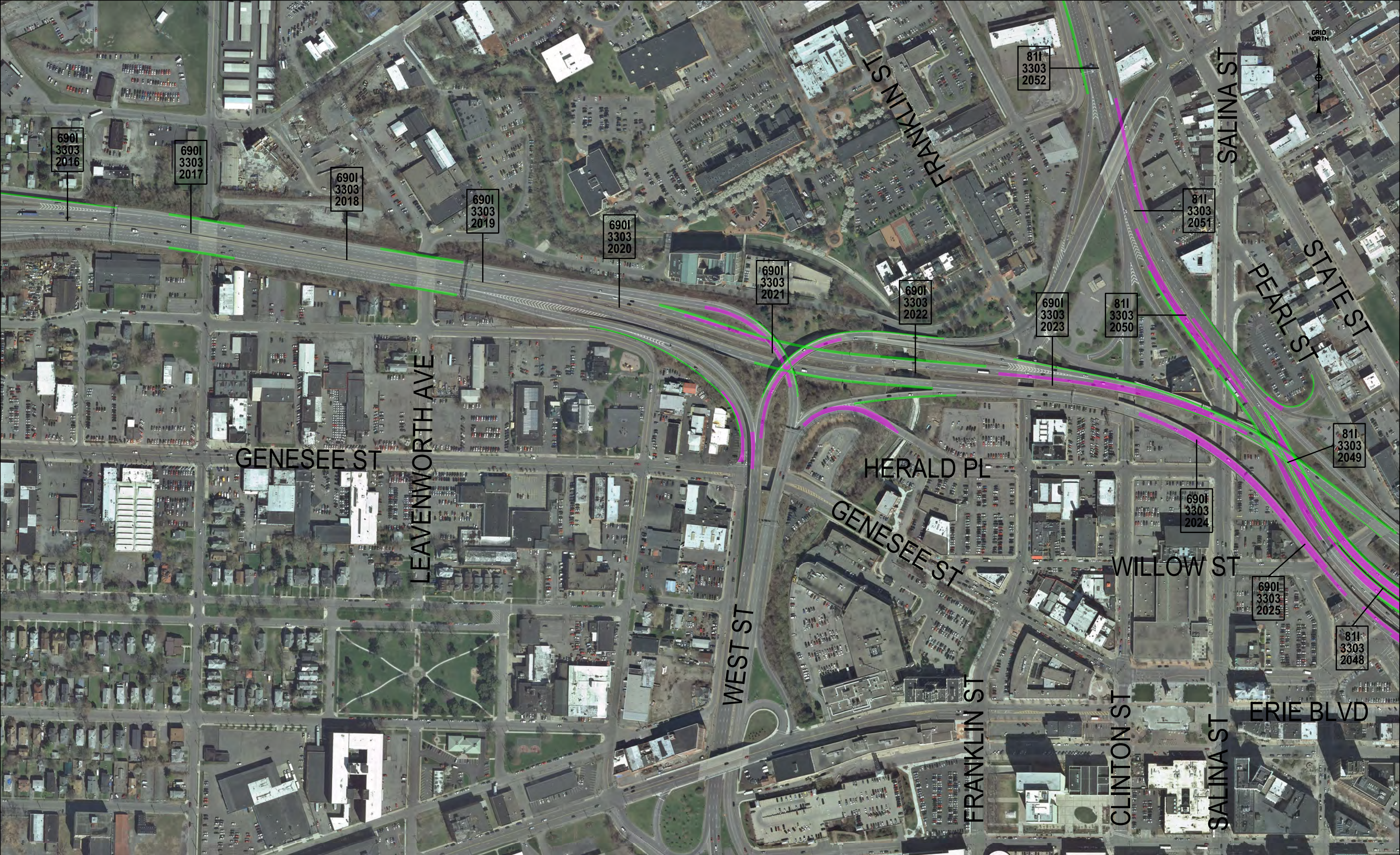
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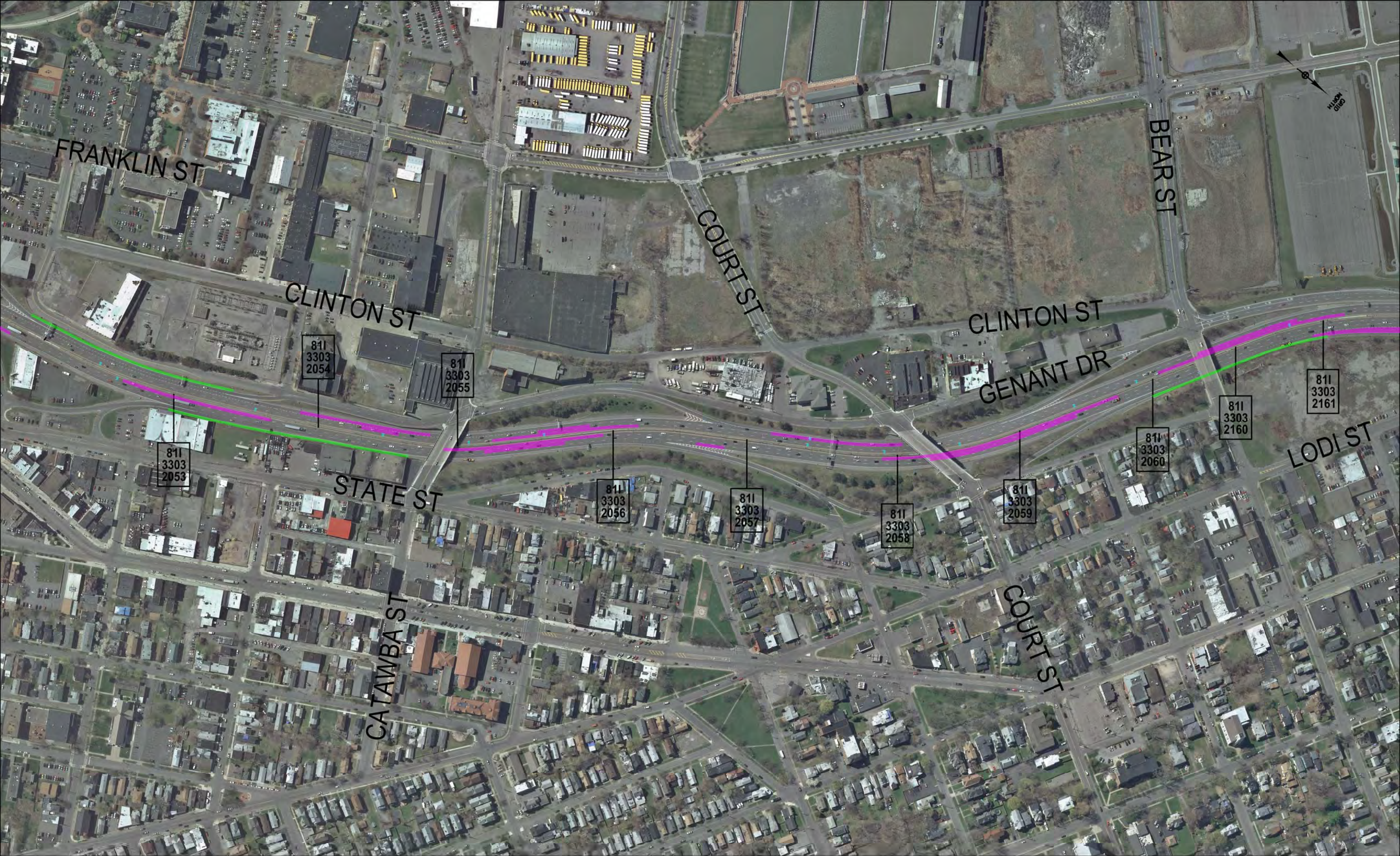
- Shoulder Width
- Median Width
- Stopping Sight Distance
- Curve Radius
- Superelevation
- Vertical Grade

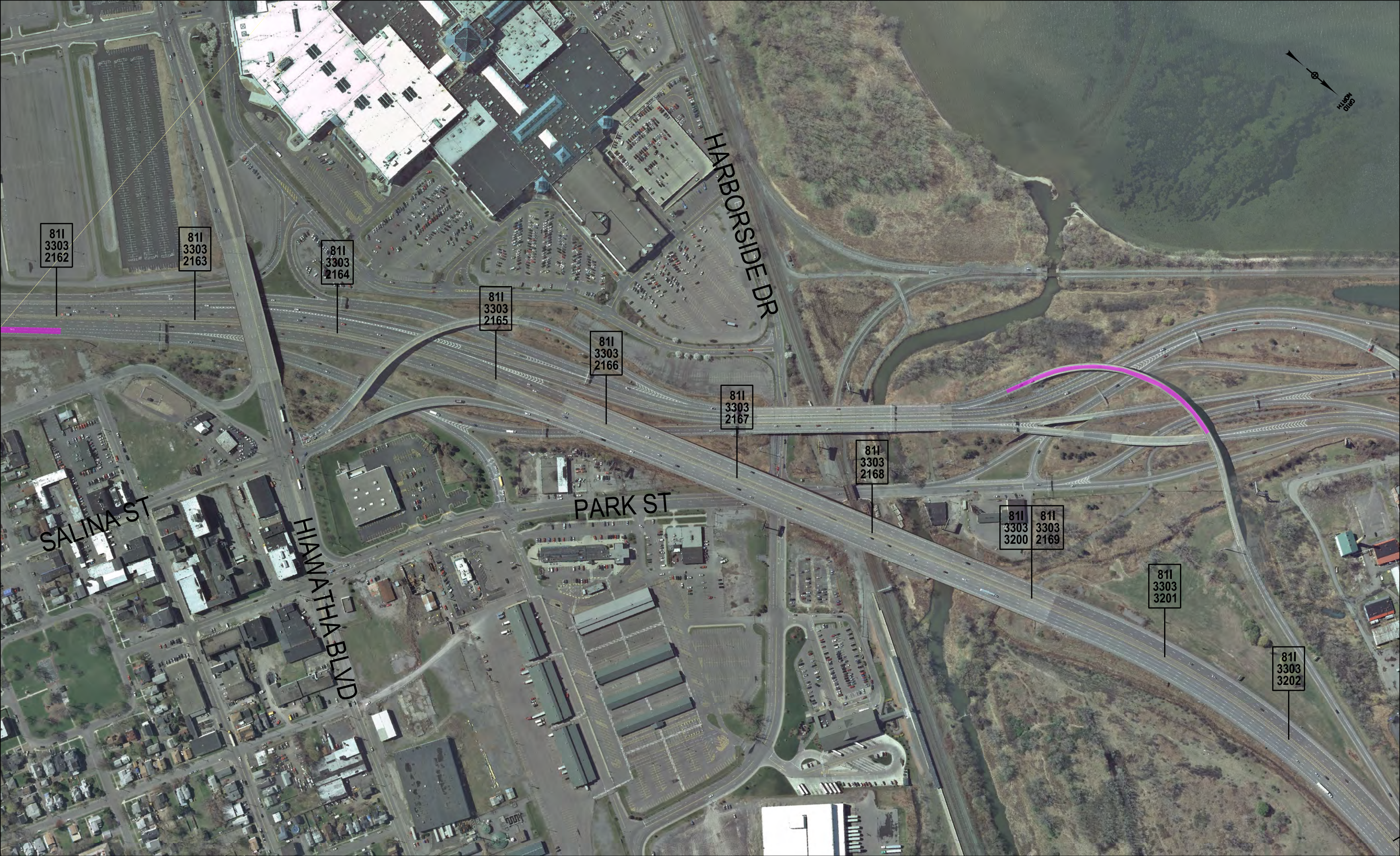








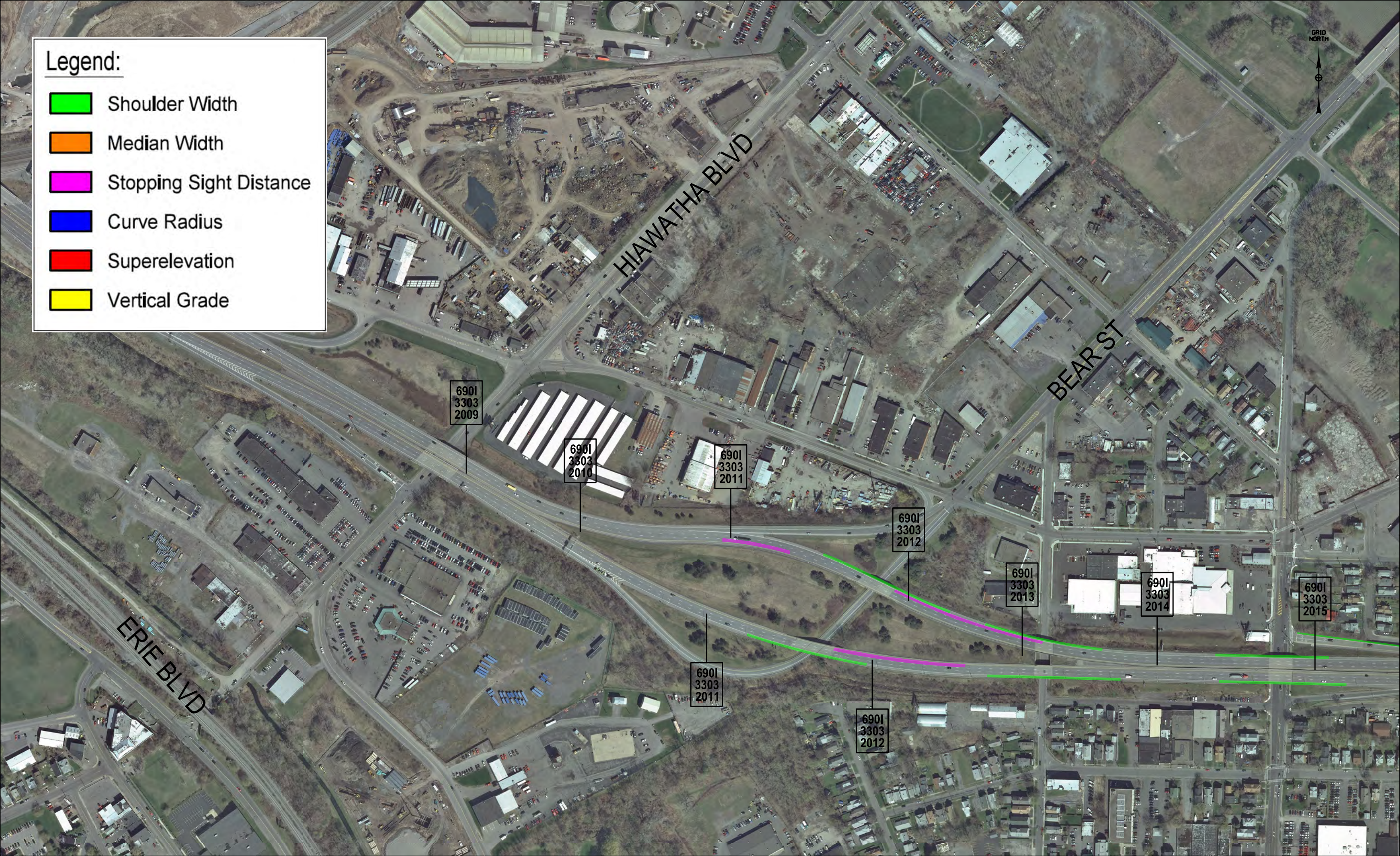


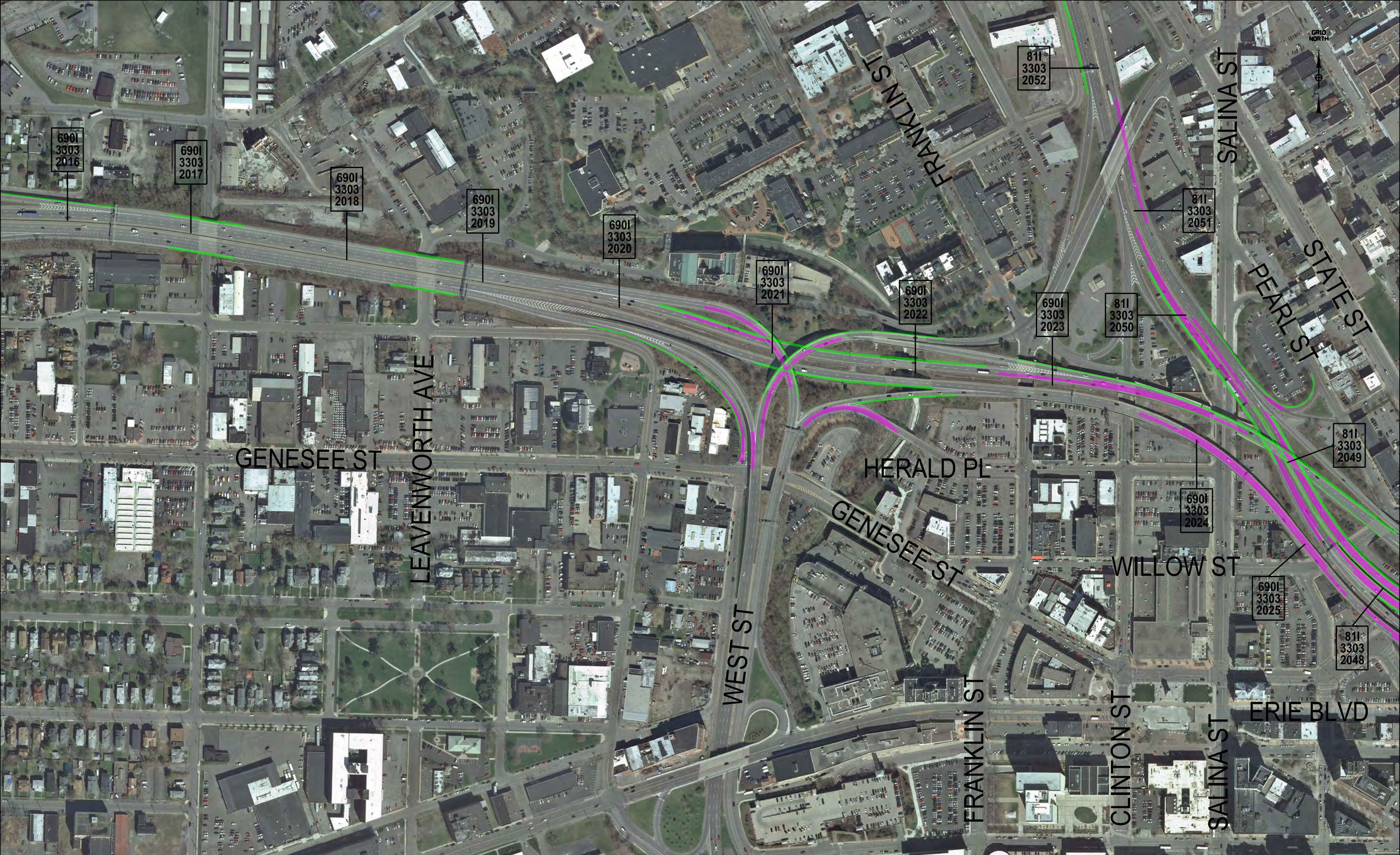


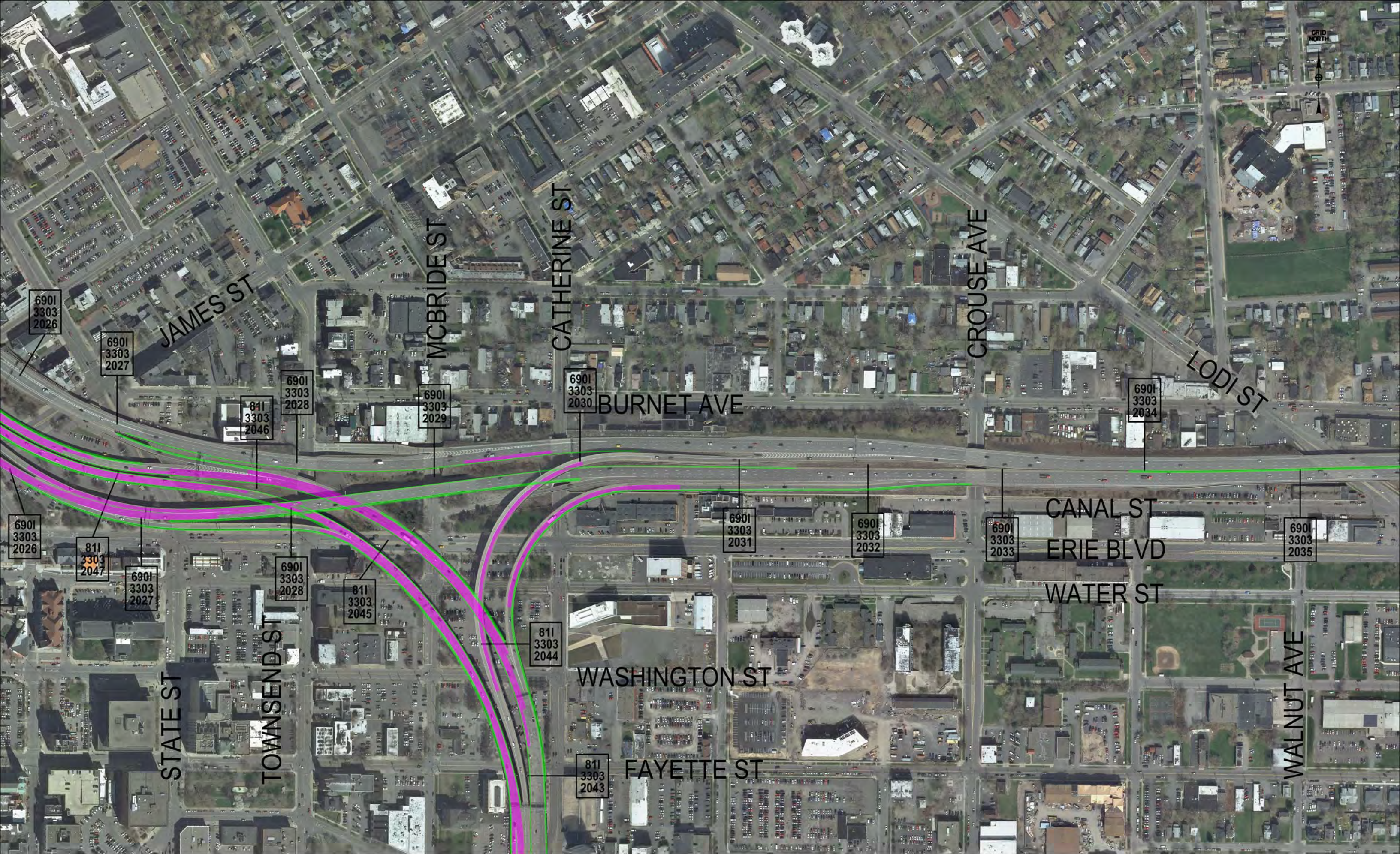


Legend:

- Shoulder Width
- Median Width
- Stopping Sight Distance
- Curve Radius
- Superelevation
- Vertical Grade











6901
3303
2046

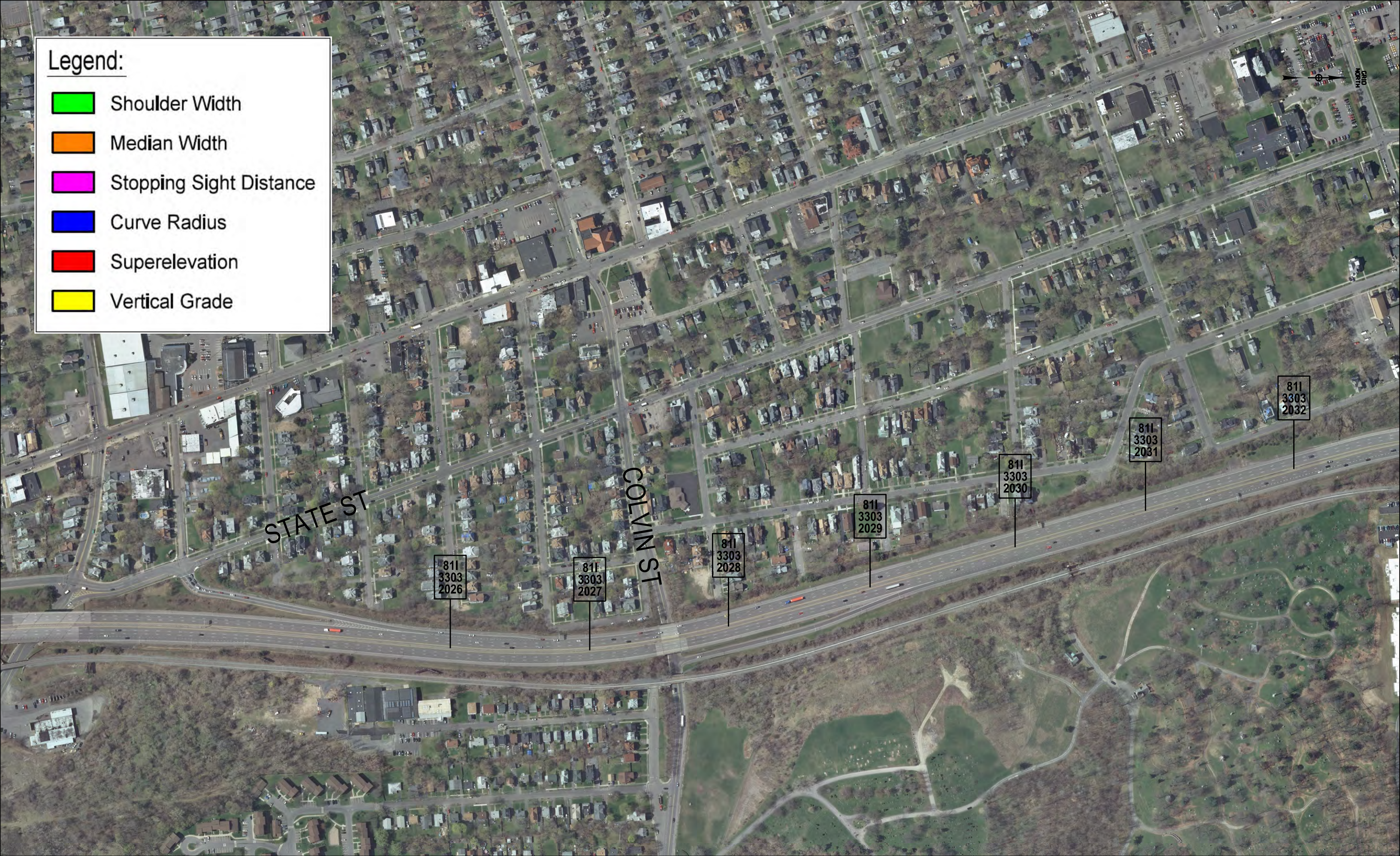
GRID
NORTH

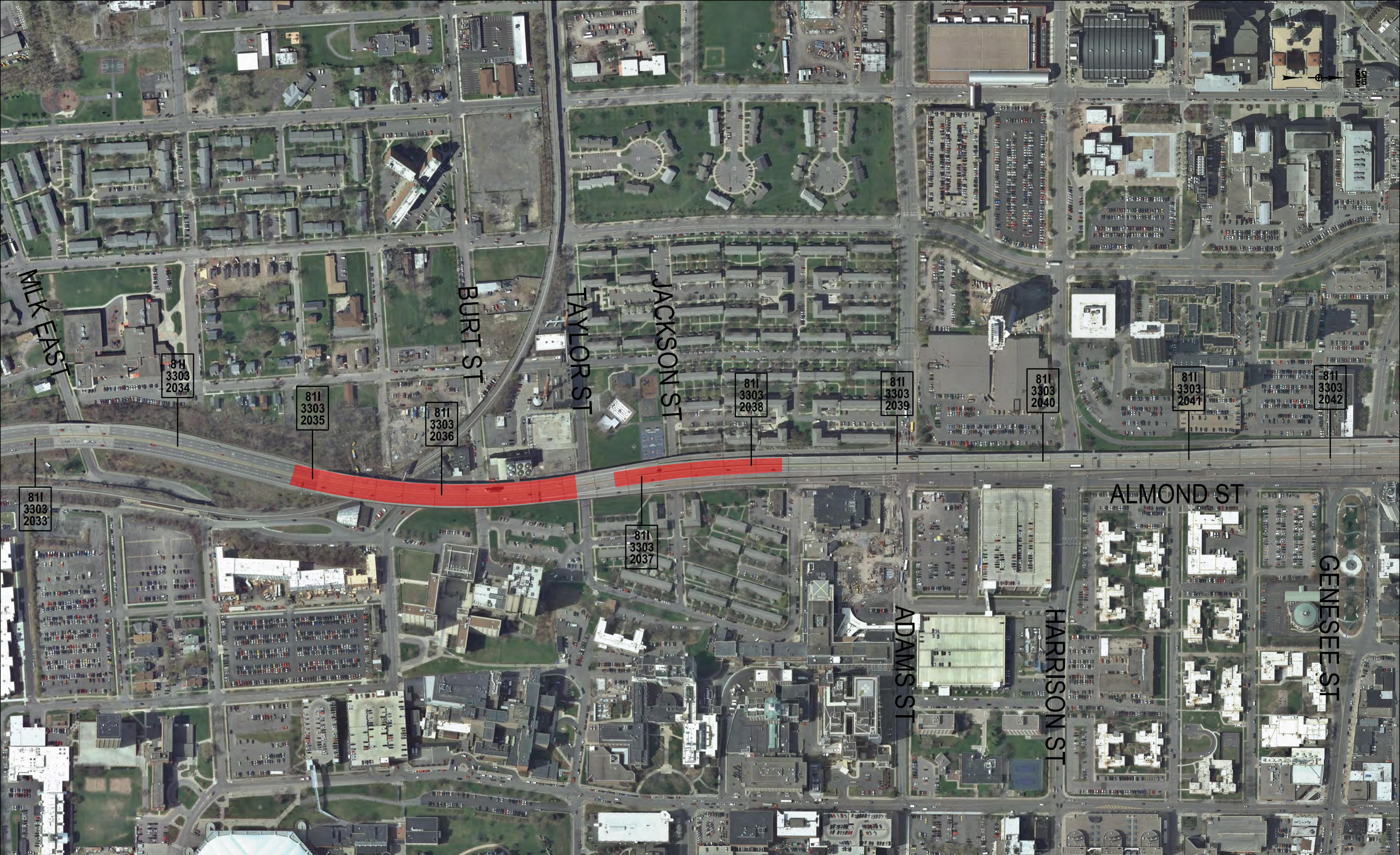
Figure 2B

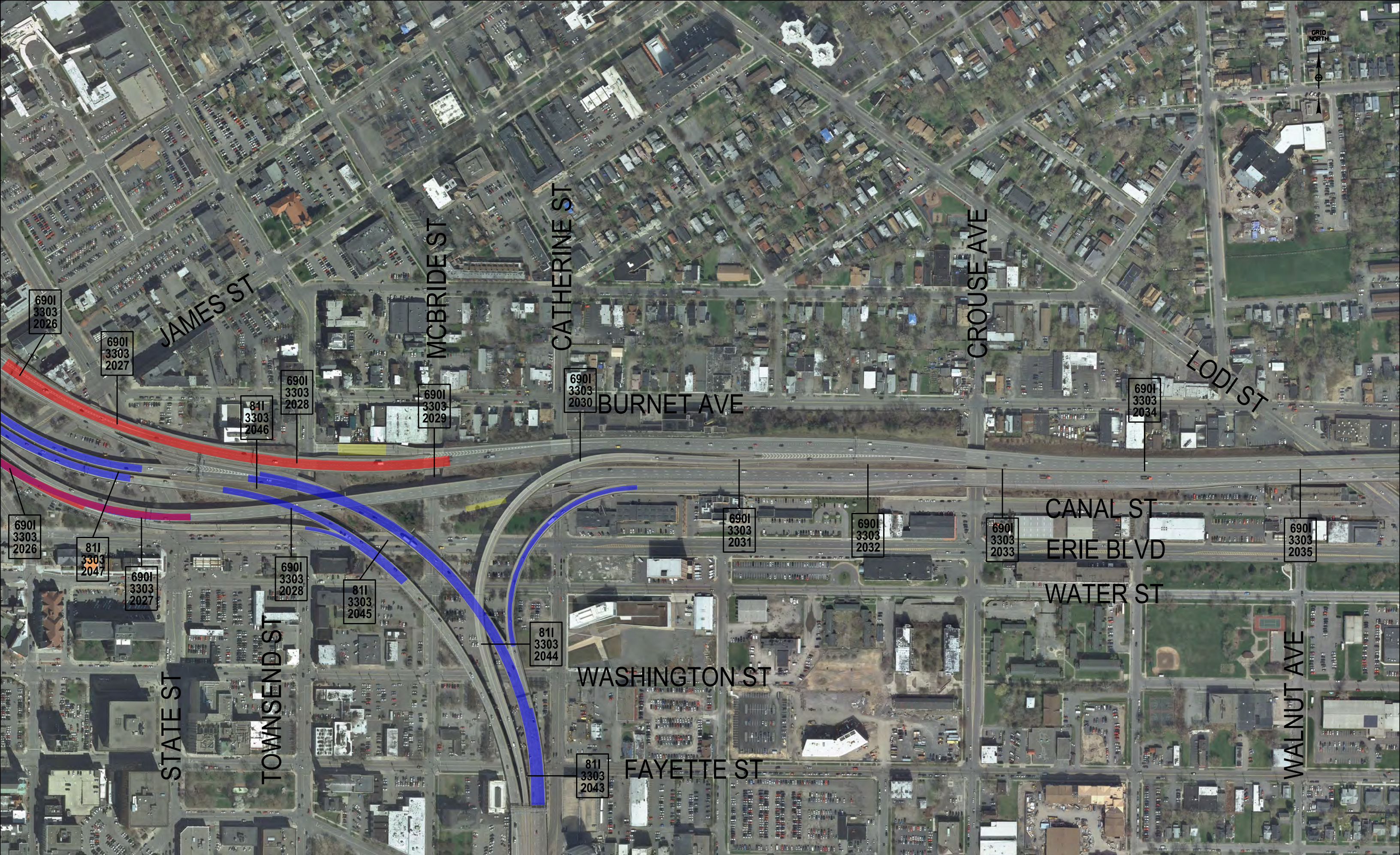
I-81 Viaduct Project – Non-Standard Curve Radius, Superelevation, and Vertical Grade

Legend:

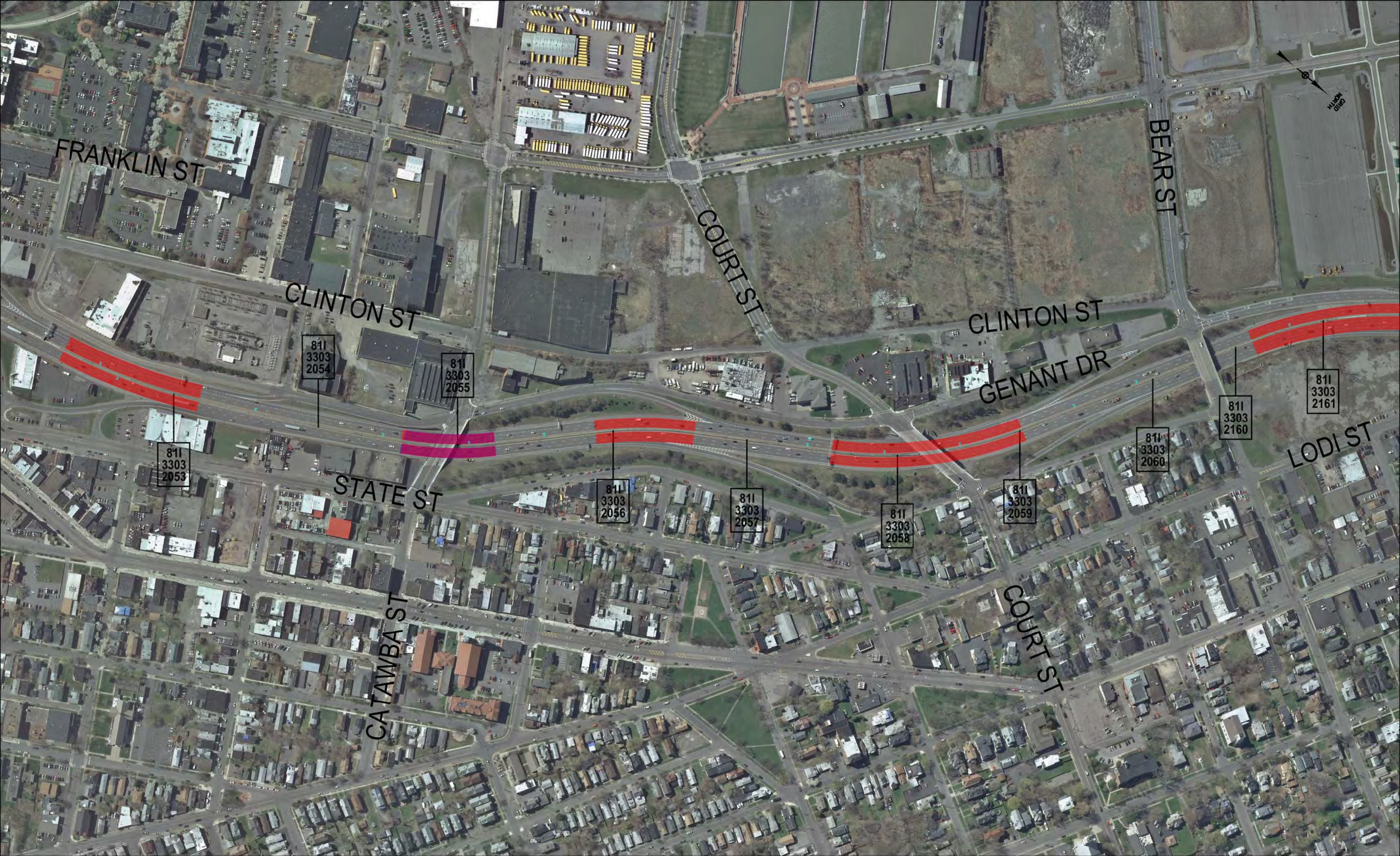
- Shoulder Width
- Median Width
- Stopping Sight Distance
- Curve Radius
- Superelevation
- Vertical Grade

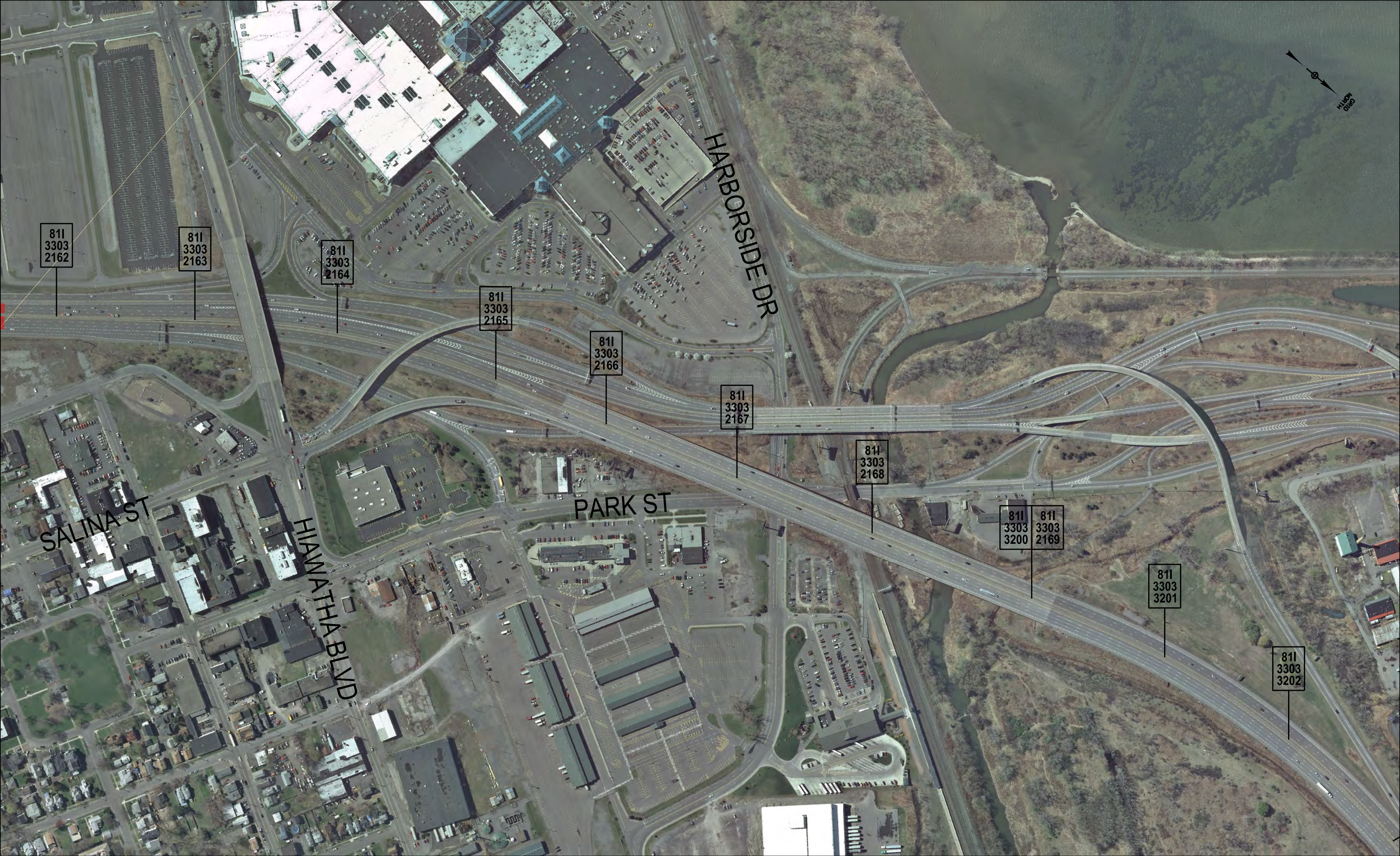








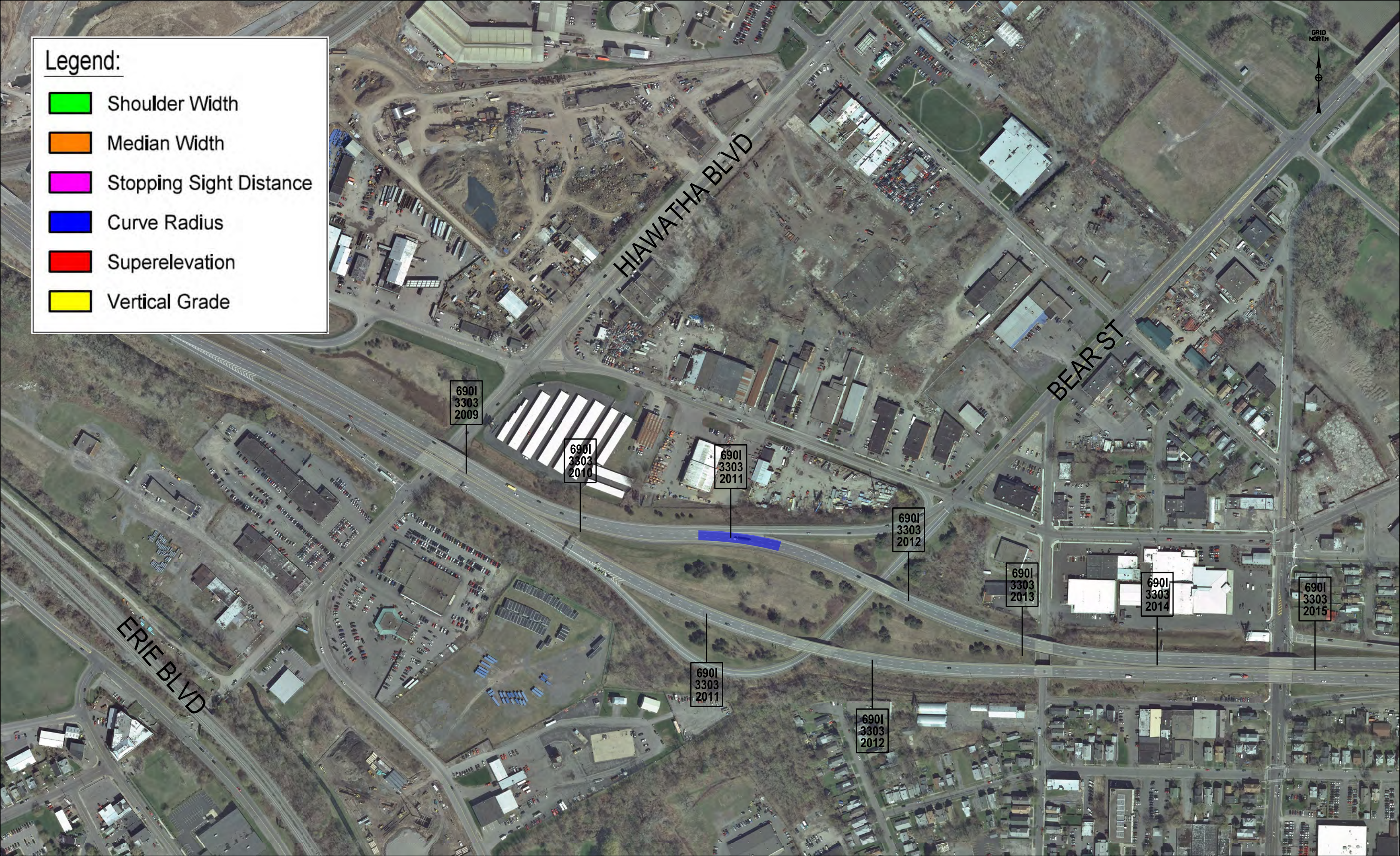






Legend:

- Shoulder Width
- Median Width
- Stopping Sight Distance
- Curve Radius
- Superelevation
- Vertical Grade





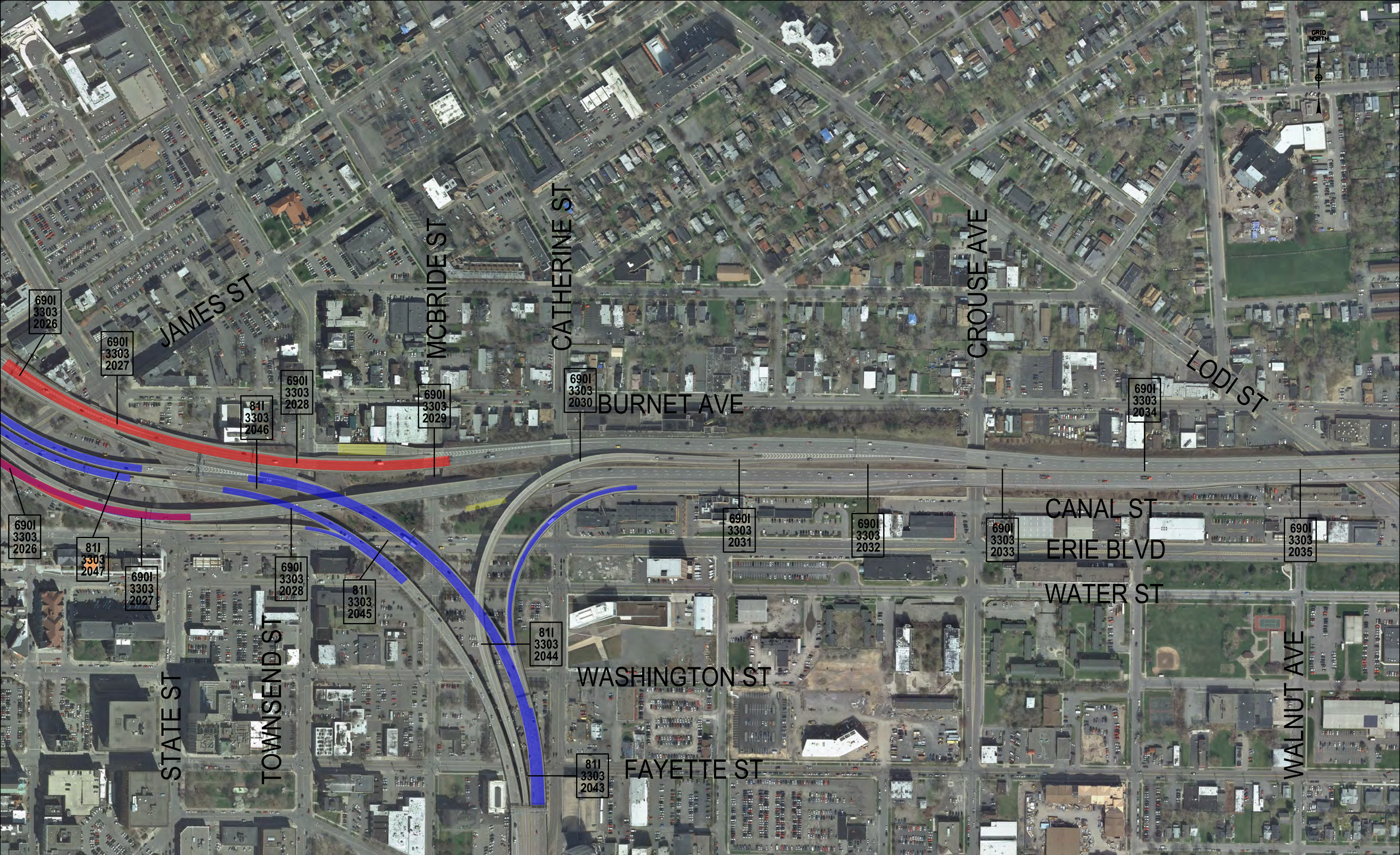
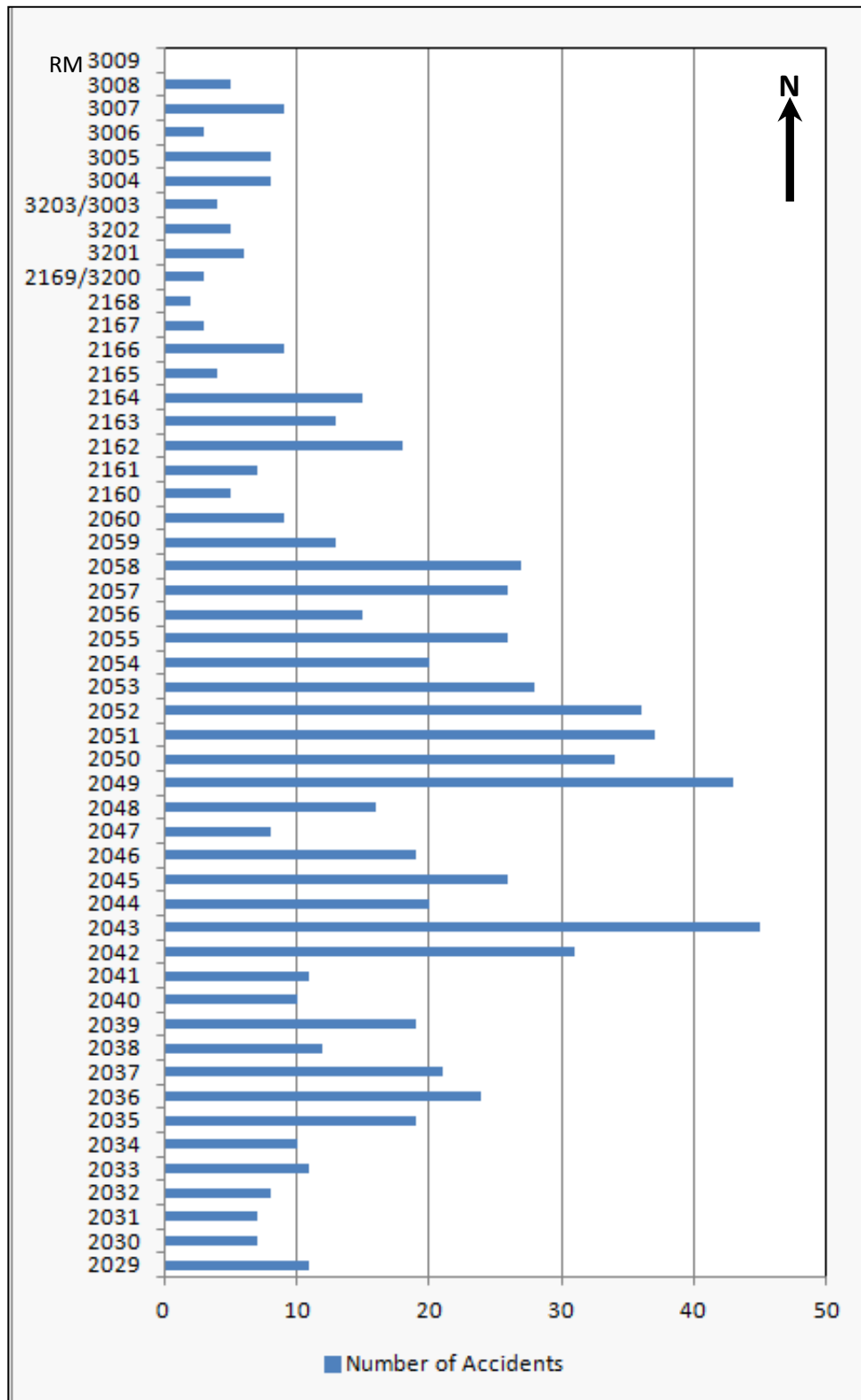






Figure 3 – Total Number of S-Curve and Slalom Area Accidents for 3-Year Period by I-81 Reference Marker



**Figure 4 – Total Number of S-Curve and Slalom Area Accidents for 3-Year Period
by I-690 Reference Marker**

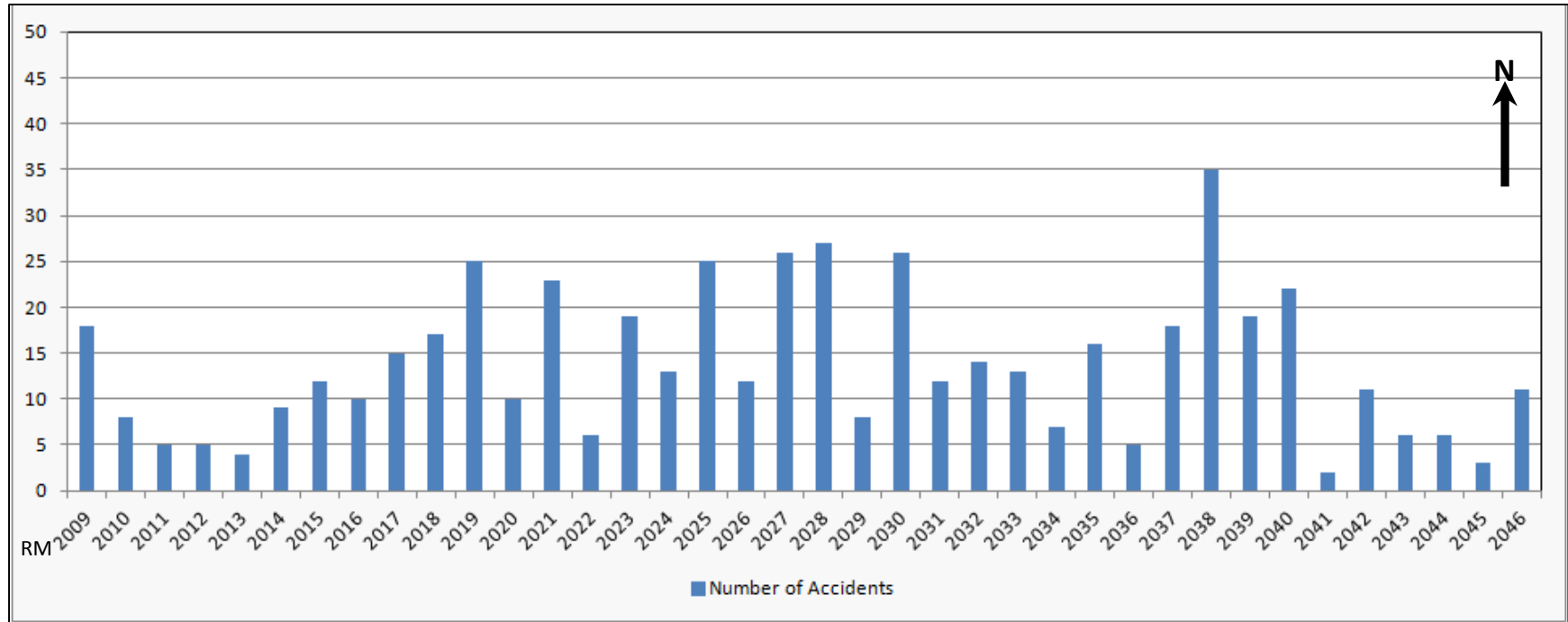
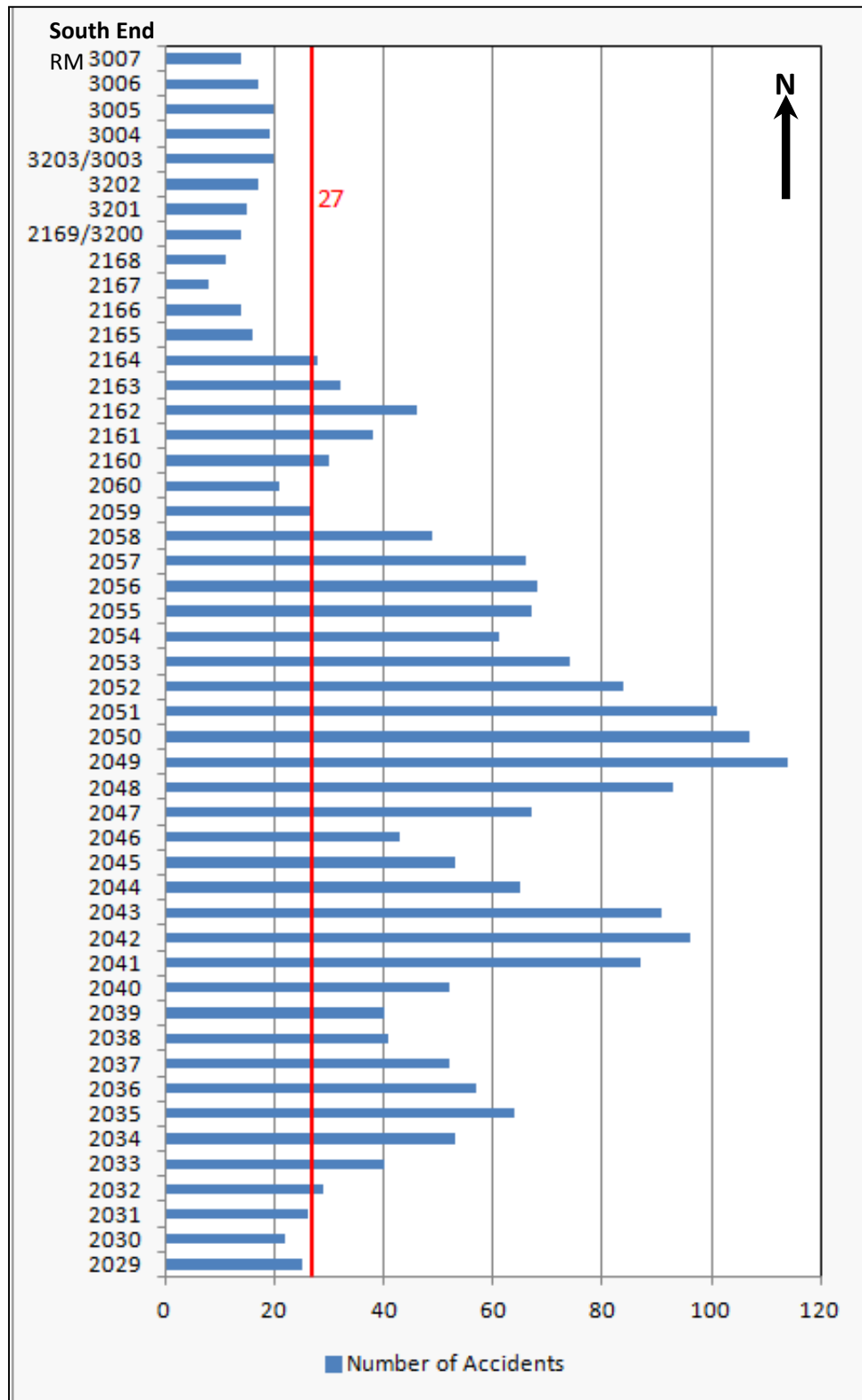
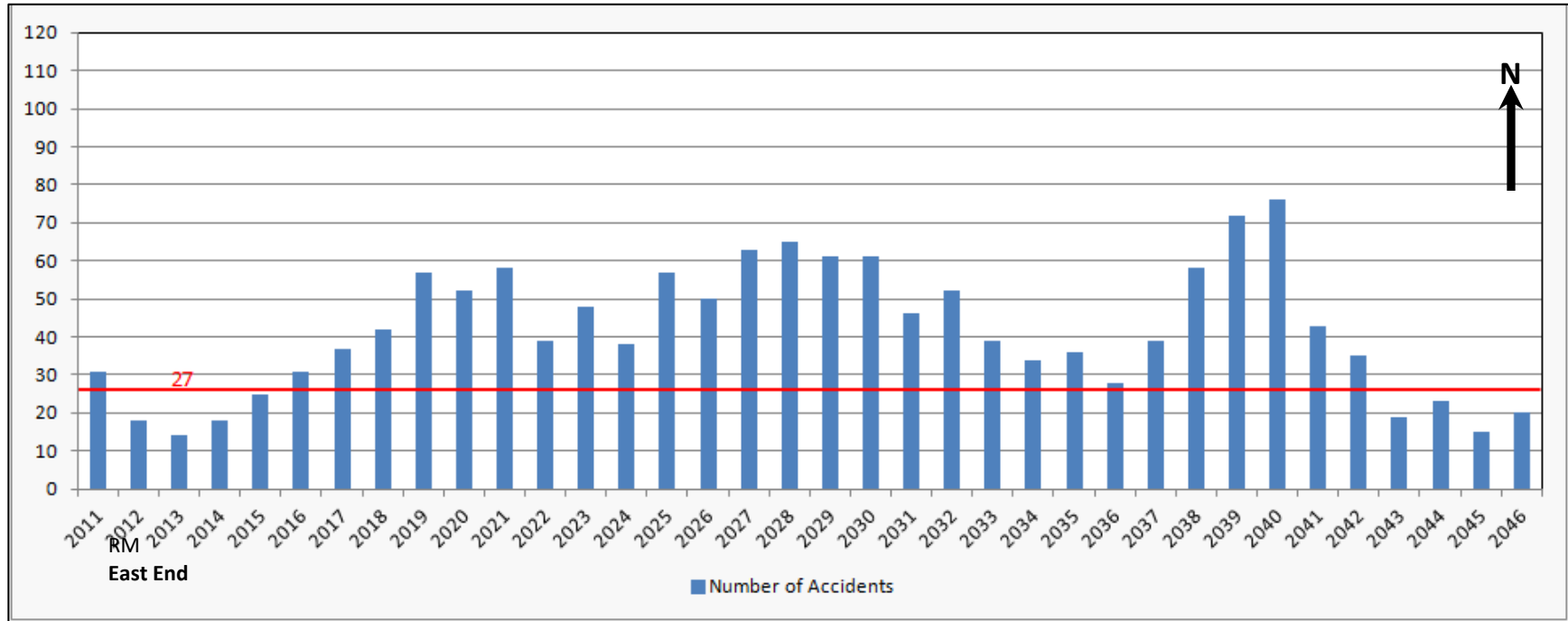


Figure 5 – Total Number of S-Curve and Slalom Area Accidents for 3-Year Period for Adjacent Three I-81 Reference Markers



Note: Based on information from NYSDOT's Safety Information Management System, for a roadway to qualify as an urban PIL in Region 3 (Syracuse), the minimum 0.3-mile segment (three adjacent reference markers) would experience 9 accidents per year or 27 accidents over the course of a 3-year period.

**Figure 6 – Total Number of S-Curve and Slalom Area Accidents for 3-Year Period
for Adjacent Three I-690 Reference Markers**



Note: Based on information from NYSDOT's Safety Information Management System, for a roadway to qualify as an urban PIL in Region 3 (Syracuse), the minimum 0.3-mile segment (three adjacent reference markers) would experience 9 accidents per year or 27 accidents over the course of a 3-year period.

Figure 7 – Correlation of S-Curve and Slalom Area Accidents to Non-Standard/Non-Conforming Features
Accident Numbers for 3-Year Period by I-81 Reference Marker

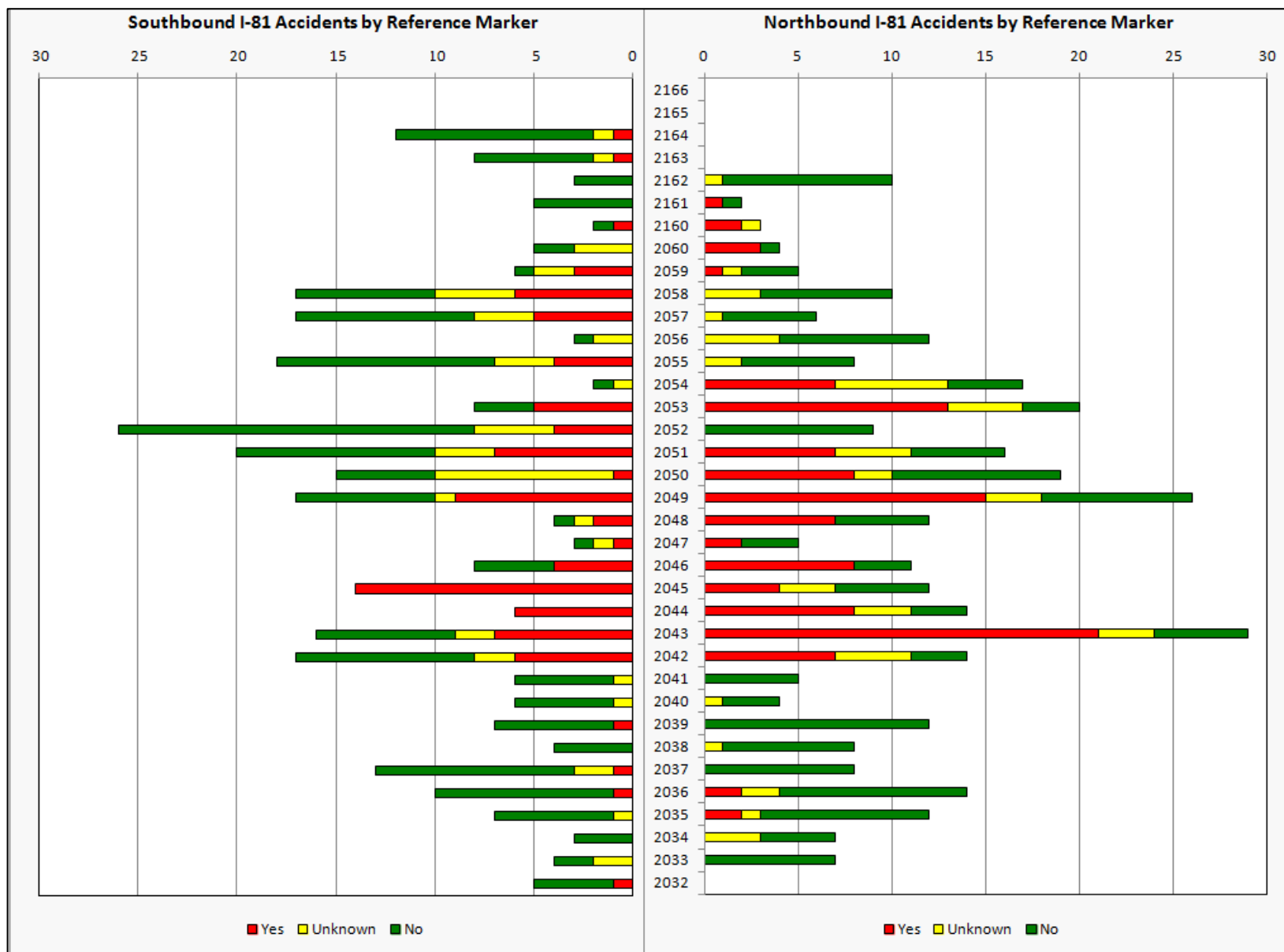
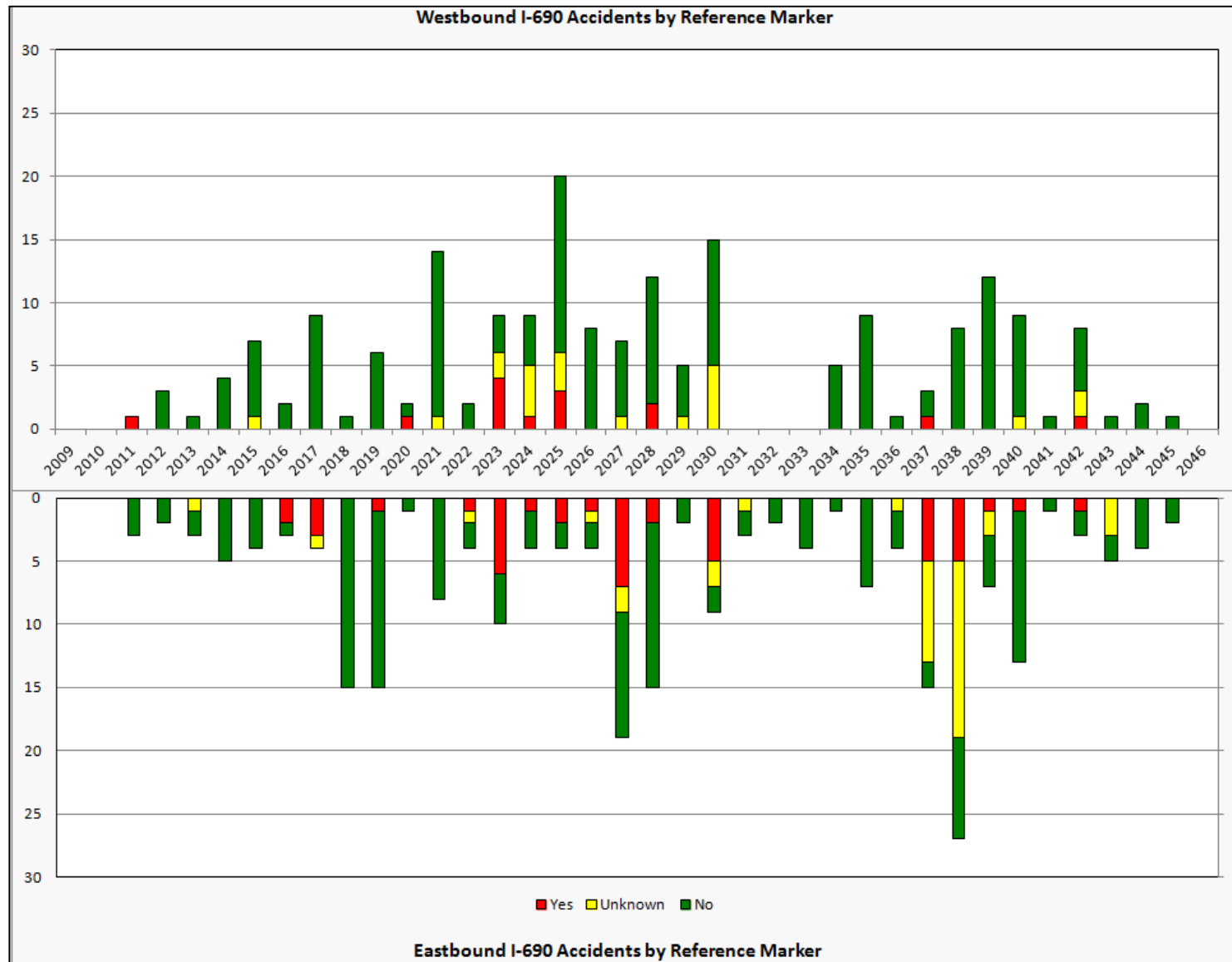


Figure 8 – Correlation of S-Curve and Slalom Area Accidents to Non-Standard/Non-Conforming Features
Accident Numbers for 3-Year Period by I-690 Reference Marker



I-81/I-481 “Northern Interchange”

I-81 Viaduct North Interchange Area – Syracuse, New York Preliminary Accident Analysis

Introduction

The I-81 viaduct “north interchange” area is the cloverleaf interchange of I-81 with NY 481/I-481 in North Syracuse (i.e., north of downtown Syracuse and north of the I-81 viaduct S-curve/slalom area). It includes the I-81 Interchange 29 and the NY 481/I-481 Interchange 9 – in the vicinities of Church Street and S. Bay and Thompson Roads. I-81 comprises the north and south legs of the north interchange area, extending from reference marker (RM) 81I 3303 3047 to RM 81I 3303 3066. The roadway is typically three lanes in each direction. NY 481 and I-481 comprise the west and east legs, respectively, of the north interchange area (i.e., the roadway’s jurisdiction changes from federal to state in the middle of the interchange). The NY 481 segment extends from RM 481 3301 1006 to RM 481 3301 1000 and then continues as the I-481 segment from RM 481I 3301 2145 to RM 481I 3301 2135. Both NY 481 and I-481 are typically two lanes in each direction. Although ramps at the interchange have their own reference markers, all ramp accidents were coded to the nearest mainline reference marker for the purposes of this preliminary analysis.

Accident data for the north interchange area was provided by NYSDOT. There were 295 accidents initially coded to the area for the three-year period from July 1, 2010 through June 30, 2013. Upon review of the accident data for this and other critical I-81 viaduct project area locations, 293 accidents were found to have actually occurred in the vicinity of the interchange – 151 on I-81, 84 on NY 481, 45 on I-481, and 13 with reference markers unknown. Graphs of the total number of known accidents by reference marker for each of the I-81 and NY 481/I-481 study segments (the applicable travel directions for each segment combined) are provided in Figure 1.

The total numbers of accidents for adjacent three reference markers (i.e., the minimum 0.3-mile length needed for a segment to qualify as a Priority Investigation Location (PIL) according to NYSDOT standards) are provided in Figure 2. As indicated in the figure, the roadway segments within or immediately adjacent to the interchange meet the NYSDOT threshold of 27 accidents (i.e., 9 per year) needed for an urban full-access controlled facility to qualify as a PIL in Region 3. The accident rates along all roadway segments in the interchange area are higher than the statewide averages for similar facilities. The accident rate on the I-81 segment (for all accident types and both travel directions combined) was calculated to be 1.24 accidents per million vehicle miles (ACC/MVM), which is 1.14 times the statewide average of 1.09 ACC/MVM; the rate along NY 481 was calculated to be 2.11 ACC/MVM, which is 1.94 times the statewide average; and the rate along I-481 was calculated to be 1.11, which is 1.02 times the statewide average. It should be noted that accident numbers north and east of the interchange drop significantly.

Detailed Non-Standard/Non-Conforming Features Analysis

Numerous non-standard features (i.e., shoulder widths, median widths, vertical grades, superelevations, curve radii, and stopping sight distances) and non-conforming features (i.e., sub-standard acceleration and deceleration lengths and ramp-to-ramp spacings) were identified in the I-81 Viaduct project area. The locations of the non-standard/non-conforming features were detailed in a previous planning study and were spot-checked in the field for this project. There are no non-conforming features in the north interchange area. However, as shown in Figure 3, there are various non-standard features – the most common of which is non-standard superelevation on the area roadways, including some ramps. It should be noted, however, that significant portions of the study area north and east of the interchange do not have any non-standard features and were not identified to have high accident numbers. For this reason, further

Figure 1 – Total Number of Accidents for 3-Year Period by Reference Marker

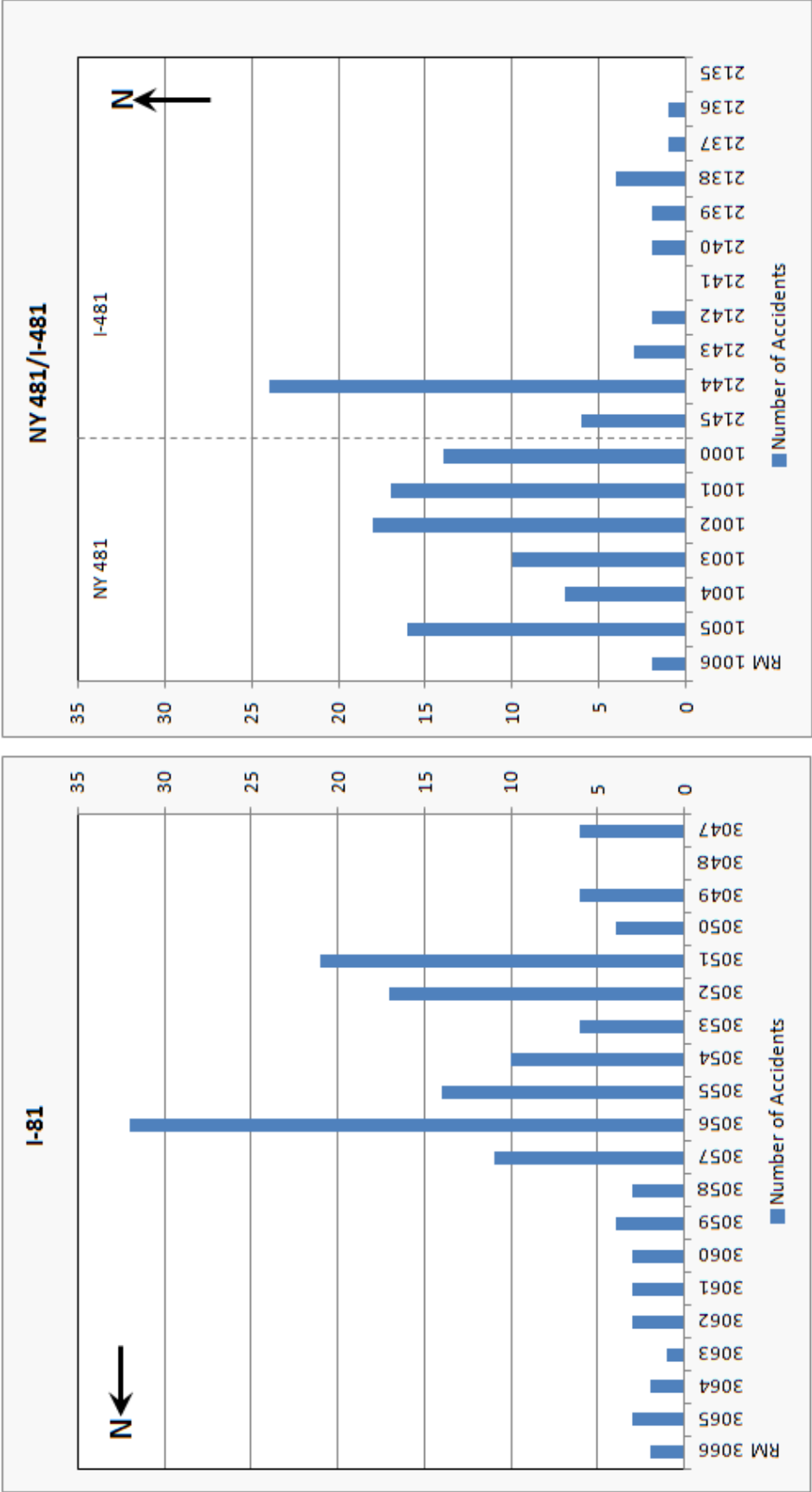


Figure 2 – Total Number of Accidents for 3-Year Period for Adjacent 3 Reference Markers

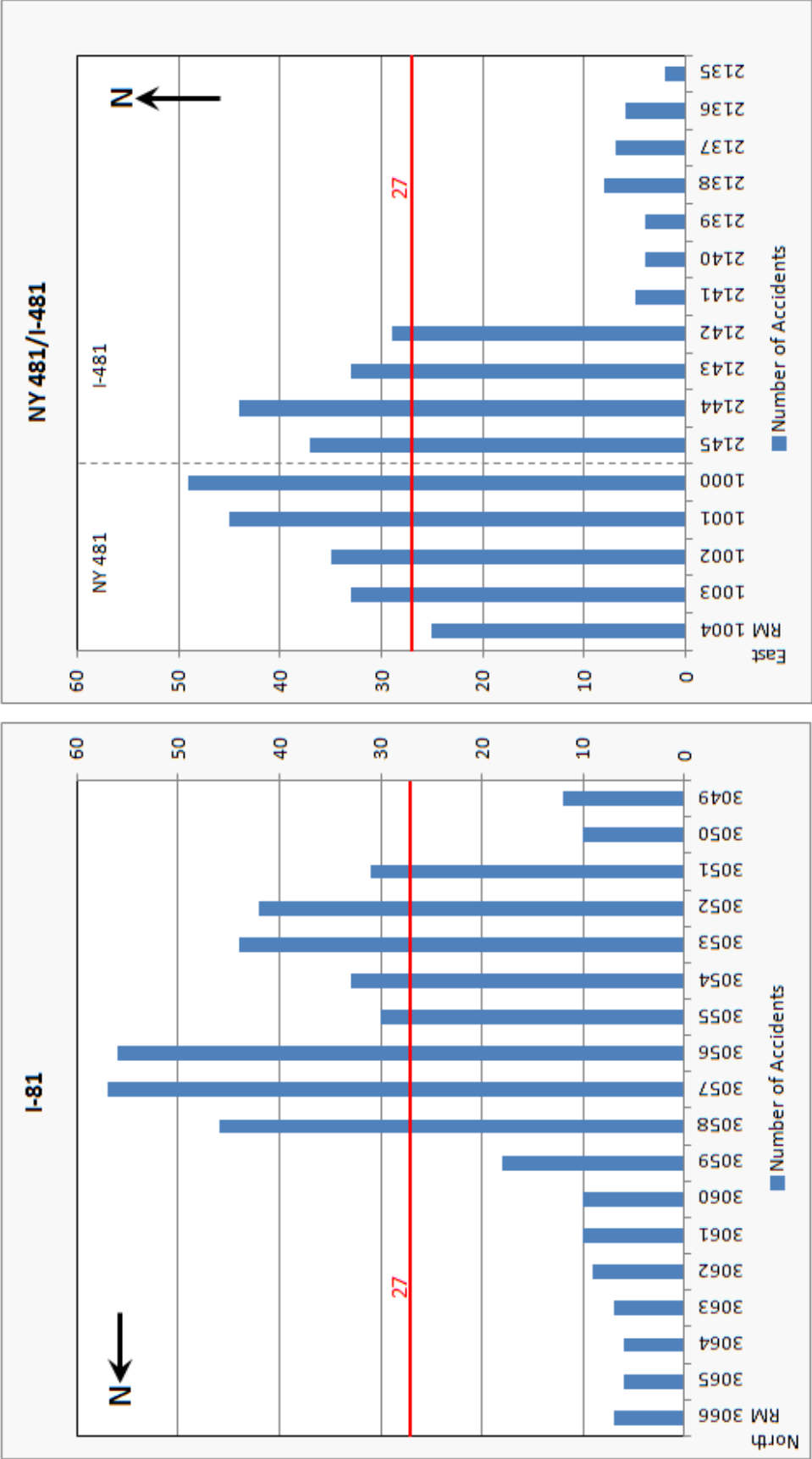


Figure 3

I-81 Viaduct Project – Non-Standard Features



Legend:

- Shoulder Width
- Median Width
- Stopping Sight Distance
- Curve Radius
- Superelevation
- Vertical Grade

VALENTINE DR.

CHURCH ST

811
3303
3047

811
3303
3048

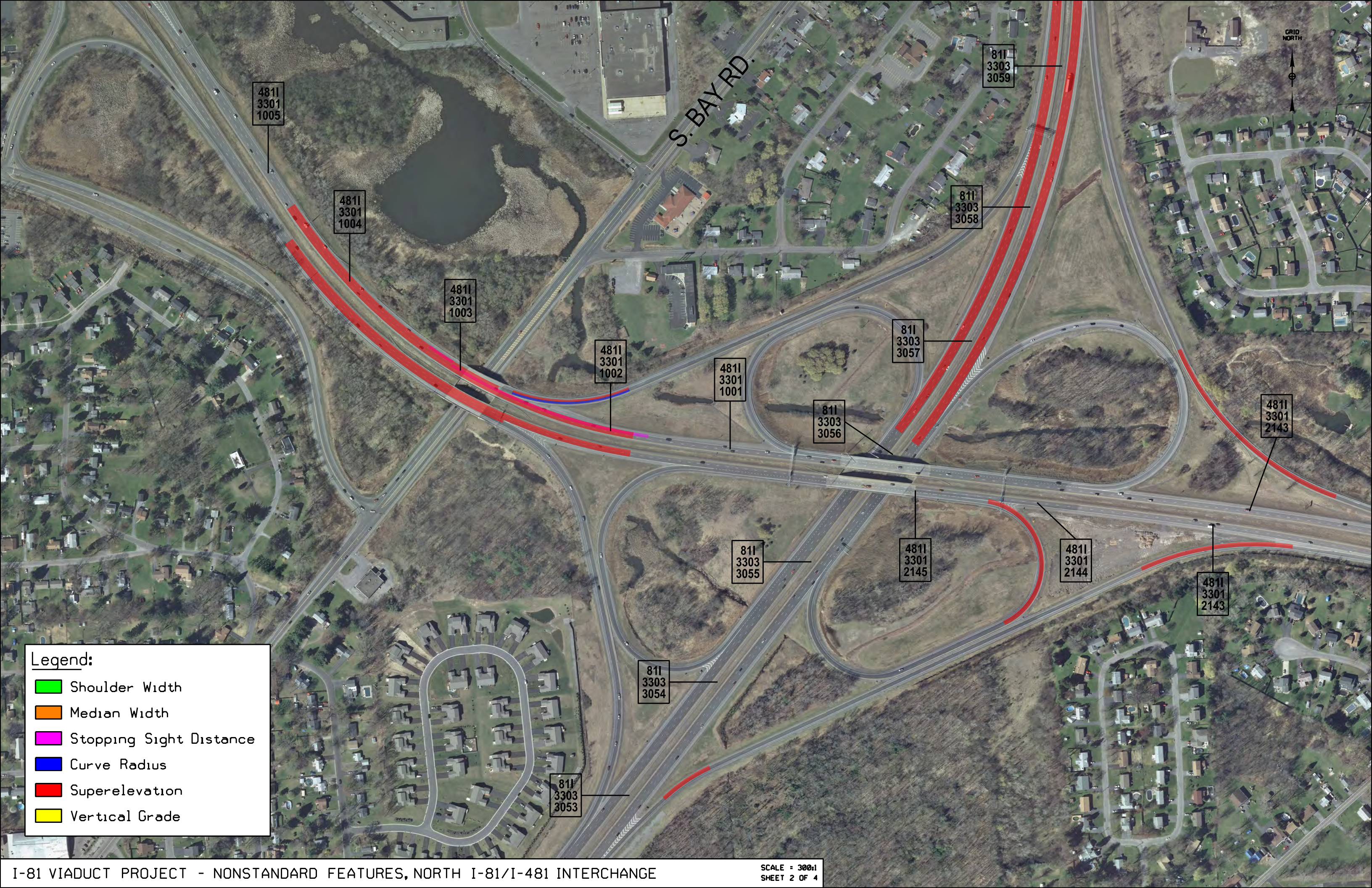
811
3303
3049

811
3303
3050

811
3303
3051

811
3303
3052





Legend:

- Shoulder Width
- Median Width
- Stopping Sight Distance
- Curve Radius
- Superelevation
- Vertical Grade



Legend:

- Shoulder Width
- Median Width
- Stopping Sight Distance
- Curve Radius
- Superelevation
- Vertical Grade

THOMPSON RD.

SMITH RD.

4811
3301
2142

4811
3301
2141

4811
3301
2140

4811
3301
2139

4811
3301
2138

4811
3301
2137

4811
3301
2136

4811
3301
2135

4811
3301
2134

4811
3301
2141

4811
3301
2140

4811
3301
2139

4811
3301
2138

4811
3301
2137

4811
3301
2136

4811
3301
2135

4811
3301
2134



GRID NORTH

811
3303
3060

811
3303
3061

811
3303
3062

811
3303
3063

811
3303
3064

811
3303
3065

Legend:

- Shoulder Width
- Median Width
- Stopping Sight Distance
- Curve Radius
- Superelevation
- Vertical Grade

S. BAY RD.

examination of the correlation of accidents to non-standard features in the north interchange area is limited to I-81 between RM 3047 and RM 3060, NY 481 between RM 1005 and RM 1000, and I-481 between RM 2145 and RM 2142.

There were a total of 253 accidents in the modified study area during the three-year accident analysis period. However, non-standard features may differ by direction, and some combinations of reference markers and directions do not have any non-standard features. Because of this, only 100 accidents (61 along I-81, 30 along NY 481, and 9 along I-481) were identified to have actually occurred in areas with non-standard features. An examination of police accident reports indicates that only 8 of the known 100 accidents were likely attributable to a non-standard feature. Instead, the accidents occurred due to a variety of other factors, including speeding, unsafe lane changing, peak-hour congestion at ramps, animals in the roadway, debris in the roadway, inclement weather conditions, etc. A summary of the correlation of accidents to non-standard features is provided in the table below, and detailed information by reference marker for the I-81 and NY 481/I-481 corridors is provided in Figures 4 and 5, respectively. As shown in the figures, all 11 accidents that were identified to be related to, including the 3 that could not be eliminated from being related to, non-standard features were approaching or near ramps. All but one of the 9 accidents along I-81 were attributed to non-standard sight distance, while both of the accidents on NY 481 were attributed to non-standard curve radius and/or superelevation. Details of the critical accident locations with non-standard features are provided in the following sections.

I-81

Southbound

No	26	84%
Yes	4	13%
Unknown	1	3%

Total 31

Northbound

No	26	86%
Yes	2	7%
Unknown	2	7%

Total 30

NY 481/I-481

Westbound

No	10	83%
Yes	2	17%
Unknown	0	0%

Total 12

Eastbound

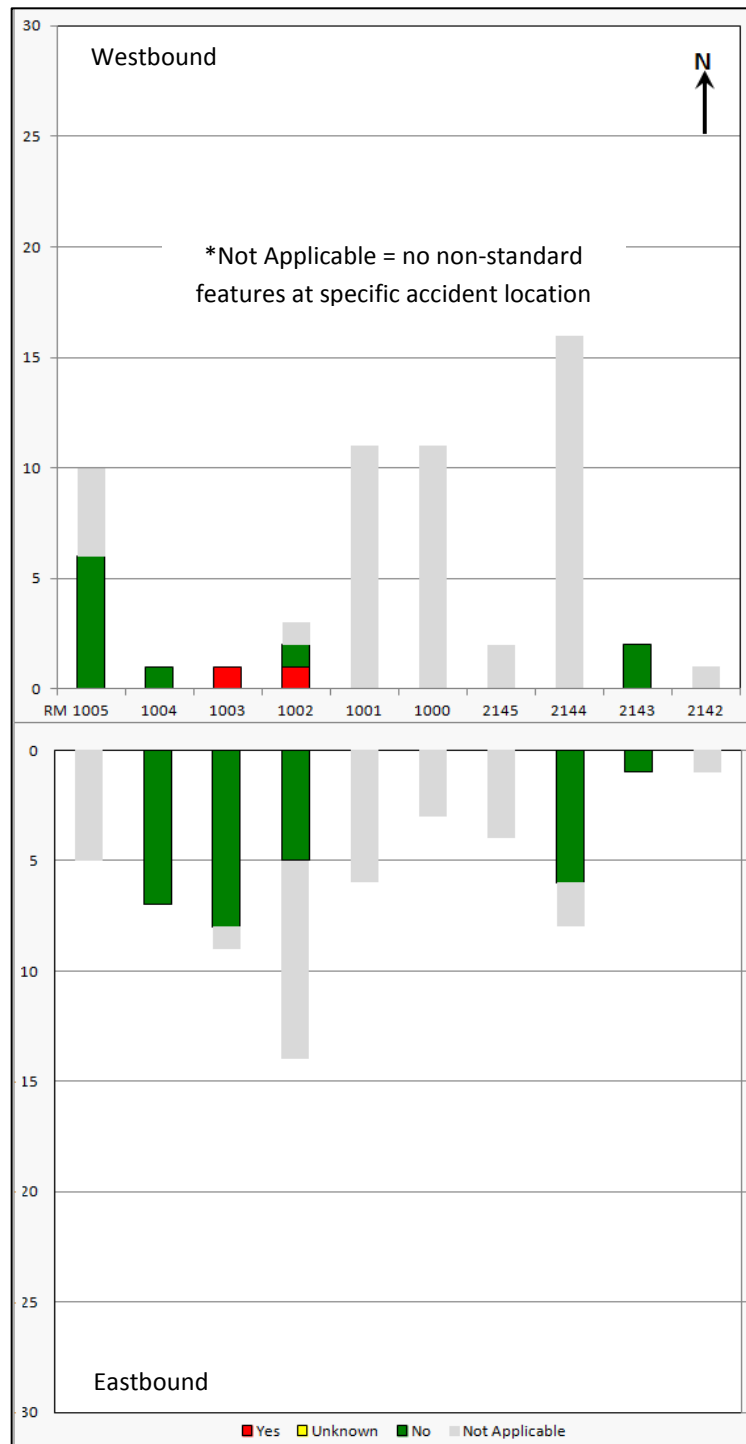
No	27	100%
Yes	0	0%
Unknown	0	0%

Total 27

Figure 4 – Correlation of Total Number of Accidents for 3-Year Period to Non-Standard Features by I-81 Reference Marker



Figure 5 – Correlation of Total Number of Accidents for 3-Year Period to Non-Standard Features by NY 481/I-481 Reference Marker



Northbound I-81 RM 3049 to RM 3051: Approaching the I-481 Southbound Off-Ramp

15 total accidents

- 2 potentially attributable to non-standard features
- 2 unknown/could be attributable to non-standard features
- 11 not attributable to non-standard features

Of the 4 accidents that may have been attributable to non-standard features,

- all were rear-end.
- all were property-damage-only (PDO).
- 3 occurred during the weekday evening commuter peak period.

The primary geometric feature that could be contributing to accidents in the area is non-standard sight distance on the curve approaching the off-ramp. A horizontal alignment change to meet sight distance standards (i.e., C 40, according to NYSDOT's July 2013 PIES – Reduction Factor Report) would result in approximately a 30 percent decrease in related accidents – a reduction of 0.3 accident at RM 3049, 0.3 accident at RM 3050, and 0.6 accident at RM 3051.

Southbound I-81 RM 3056: At the I-481 Northbound On-Ramp

4 total accidents

- 1 potentially attributable to non-standard features
- 3 not attributable to non-standard features

The 1 accident that may have been attributable to non-standard features was an overtake accident that resulted in injury. It occurred in the mainline transition from a curved to straight segment and could have been related to non-standard superelevation in the area. An upgrading of superelevation to standards (C 43 in the PIES – Reduction Factor Report) would result in a 48 percent decrease in related accidents – a reduction of 0.48 accident at RM 3056.

Southbound I-81 RM 3052 to RM 3051: At the NY 481 Southbound On-Ramp

13 total accidents

- 3 potentially attributable to non-standard features
- 1 unknown/could be attributable to non-standard features
- 9 not attributable to non-standard features

Of the 4 accidents that may have been attributable to non-standard features,

- 2 were rear-end, 1 was overtake, and 1 was fixed-object.
- 3 resulted in injury, and 1 was PDO.
- 3 occurred in snow or heavy rain.
- 1 occurred during the weekday morning, and 2 during the weekday evening, commuter peak period.

The primary geometric feature that could be contributing to accidents in the area is non-standard sight distance on the mainline in the vicinity of the on-ramp merge. A horizontal alignment change to meet sight distance standards (i.e., C 40 in the PIES – Reduction Factor Report) would result in approximately a 30 percent decrease in accidents in the area – a reduction of 0.6 accident each at RM 3052 and RM 3051.

Westbound NY 481 RM 1002 to RM 1003: At the I-81 Southbound On-Ramp

3 total accidents

- 2 potentially attributable to non-standard features
- 1 not attributable to non-standard features

Of the 2 accidents that may have been attributable to non-standard features,

- both were fixed-object.
- both were PDO.
- both occurred on slippery roadway.
- 1 occurred during the late weekday morning, and 1 during the late weekday evening, commuter peak period.

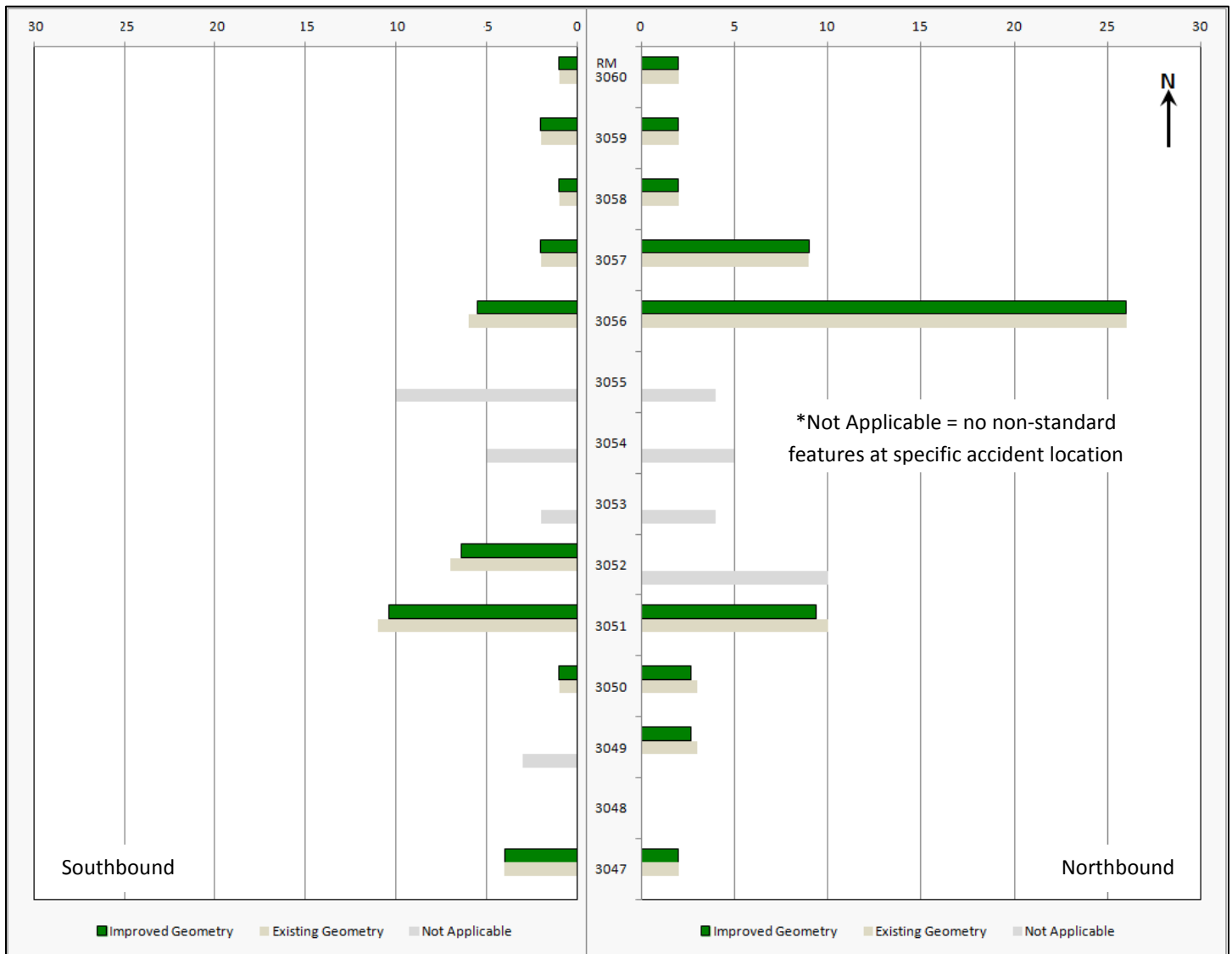
The primary geometric features that could be contributing to accidents in the area are non-standard curve radius and superelevation on the on-ramp. A horizontal alignment change to meet standards (i.e., C 40 in the PIES – Reduction Factor Report)) would result in approximately a 30 percent decrease in accidents in the area – a reduction of 0.3 accident at RM 1002 on the ramp and of 0.3 accident at RM 1003 near the end of the ramp.

Conclusion

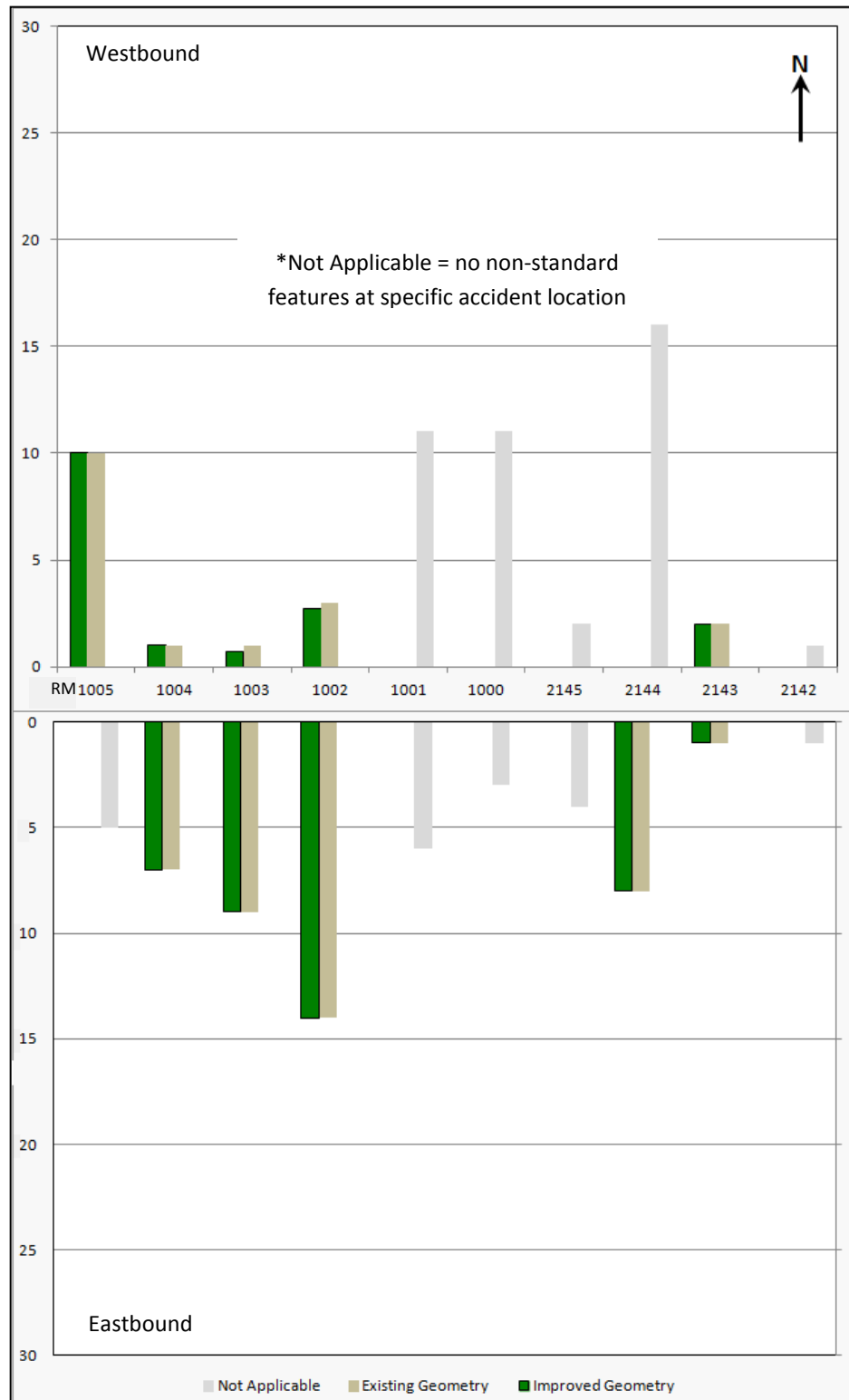
There were 293 accidents in the I-81 viaduct north interchange area during the three-year analysis period – 151 on I-81, 84 on NY 481, 45 on I-481, and 13 with reference markers unknown. However, only 100 of these accidents occurred in areas with non-standard features, and only 11 of the accidents were found to be, or could not be eliminated from being, attributable to non-standard features. Instead, most of the accidents along the area roadways occurred due to a variety of other factors, including speeding, unsafe lane changing, peak-hour congestion, animals in the roadway, debris in the roadway, inclement weather conditions, etc. Although the types of, severities of, and contributing factors to the 11 accidents that were likely related to non-standard features varied by location, the primary contributing factors were non-standard sight distance, superelevation, and curve radius. Based on accident reduction data provided in NYSDOT's latest PIES – Reduction Factor Report, correcting the contributing non-standard features would decrease the number of accidents during a three-year period in the area by approximately 3.5. This would reduce the 100 accidents that were found to occur in locations with non-standard features by 3.5 percent.

Graphs comparing the three-year accident numbers for existing conditions and for future conditions with the elimination of non-standard features are provided for the critical I-81 and NY 481/I-481 segments of the north interchange area in Figures 6 and 7 respectively.

**Figure 6 – Total Number of Accidents for 3-Year Period
Before and After Geometric Improvements by I-81 Reference Marker**



**Figure 7 – Total Number of Accidents for 3-Year Period
Before and After Geometric Improvements by NY 481/I-481 Reference Marker**



I-81/I-481 “Southern Interchange”

I-81 Viaduct South Interchange Area – Syracuse, New York Preliminary Accident Analysis

Introduction

The I-81 viaduct “south interchange” is the area surrounding and including the I-81 interchange with I-481 south of downtown Syracuse. It includes the I-81 Interchange 16A and the I-481 Interchange 1 – in the vicinities of E. Seneca Turnpike and Brighton Avenue, respectively. The area comprises reference marker (RM) 81I 3303 2006 through RM 81I 3303 2018 in the northbound and southbound directions and RM 481I 3301 1000 through RM 481I 3301 2003 in the eastbound and westbound directions.

Accident data for the south interchange area was provided by NYSDOT. There were 101 accidents initially coded to the area for the three-year period from July 1, 2010 through June 30, 2013. Upon review of the accident data for this and other critical I-81 viaduct project area locations, 90 accidents were found to have actually occurred in the vicinity of the interchange; 68 accidents were located on I-81 between RM 2006 and RM 2018, 18 were located on I-481 between RM 1000 and RM 2003, and 4 accidents had reference markers unknown. Graphs of the total number of known accidents by reference marker for each of the I-81 and I-481 study segments (the applicable travel directions for each segment combined) are provided in Figure 1.

The total numbers of accidents for adjacent three reference markers (i.e., the minimum 0.3-mile length needed for a segment to qualify as a Priority Investigation Location (PIL) according to NYSDOT standards) are provided in Figure 2. As indicated in the figure, the segment along I-81 between RM 2011 and RM 2015 is near or at the threshold of 27 accidents (i.e., 9 per year) needed to qualify as an urban PIL in Region 3. The stretch of I-481 in the south interchange area is significantly below the PIL threshold. The accident rate (all accident types and both travel directions combined) for the two-lane segment of I-81 from RM 2006 to RM 2015, which includes the potential PIL segment, was estimated to be 1.48 accidents per million vehicle miles (ACC/MVM). This is 1.36 times the statewide average of 1.09 ACC/MVM for a similar urban controlled-access facility. The accident rates for the three-lane segment of I-81 from RM 2016 to RM 2018 and for the two-lane segment of I-481 in its entire stretch within the south interchange area were estimated to be 0.75 and 0.67 ACC/MVM, respectively – both of which are significantly less than the applicable statewide averages of 1.09 ACC/MVM.

Detailed Non-Standard/Non-Conforming Features Analysis

Numerous non-standard features (i.e., shoulder widths, median widths, vertical grades, superelevation, curve radii, and stopping sight distances) and non-conforming features (i.e., sub-standard acceleration and deceleration lengths and ramp-to-ramp spacings) were identified in the I-81 Viaduct project area. The locations of the non-standard/non-conforming features were detailed in a previous planning study and were spot-checked in the field for this project. As shown in Figure 3, the only non-standard/non-conforming feature in the south interchange area is a sub-standard curve radius in the northbound direction of I-81 between the off-ramp to I-481 North and the on-ramp from I-481 South (i.e., between RM 2012 and RM 2014). This is in the same general area, and the only area that was identified above, as a high-accident and potential PIL location. Further examination of the correlation of accidents to non-standard features in the south interchange area will, therefore, be limited to I-81 between RM 2011 and RM 2015.

Since the non-standard curve radius only exists in the northbound direction of I-81, a breakdown of the accidents in the RM 2011 to RM 2015 area was made by direction. As shown in Figure 4, there were 30 accidents in the northbound direction and 14 accidents in the southbound direction during the three-

Figure 1

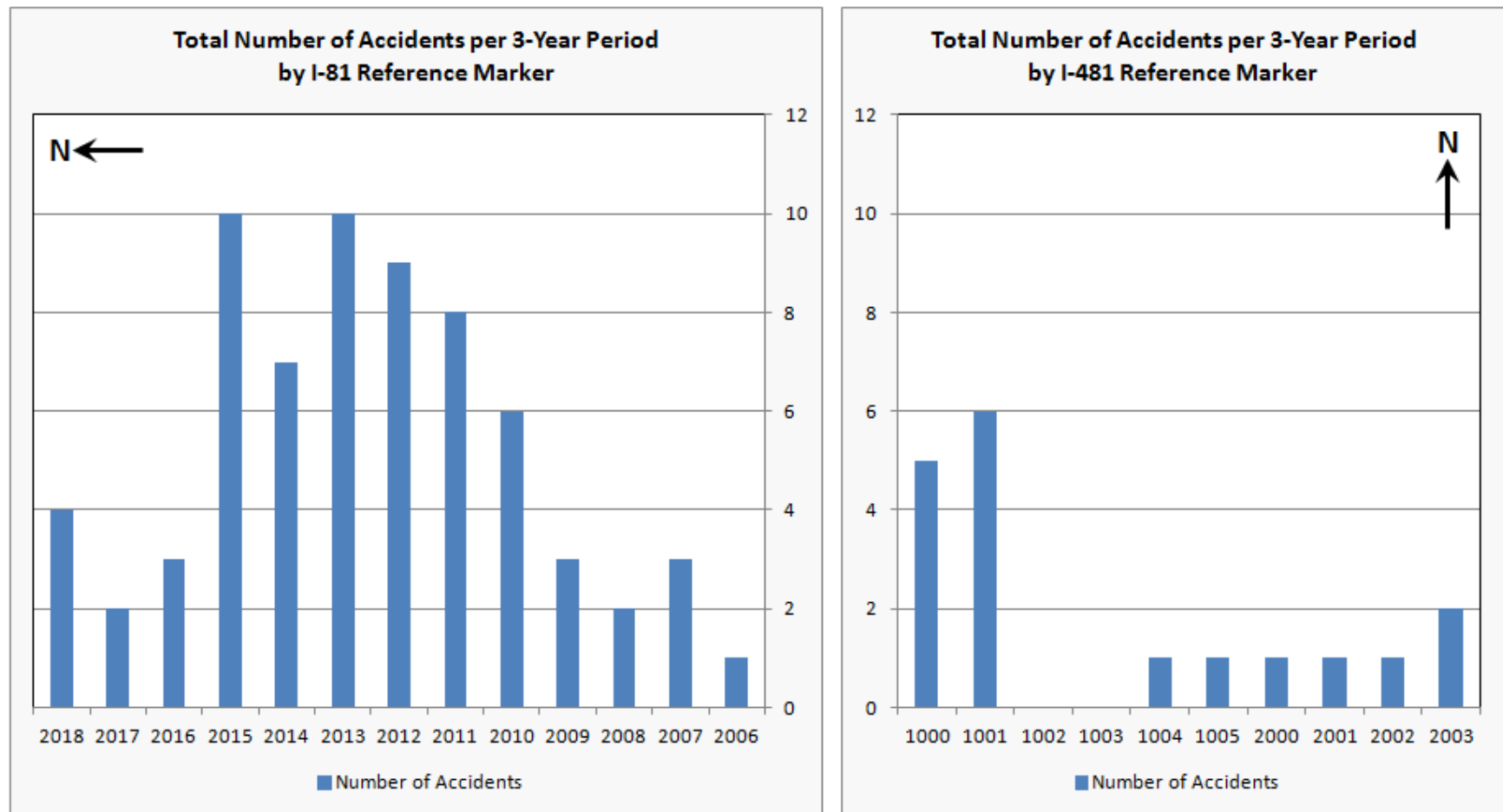


Figure 2

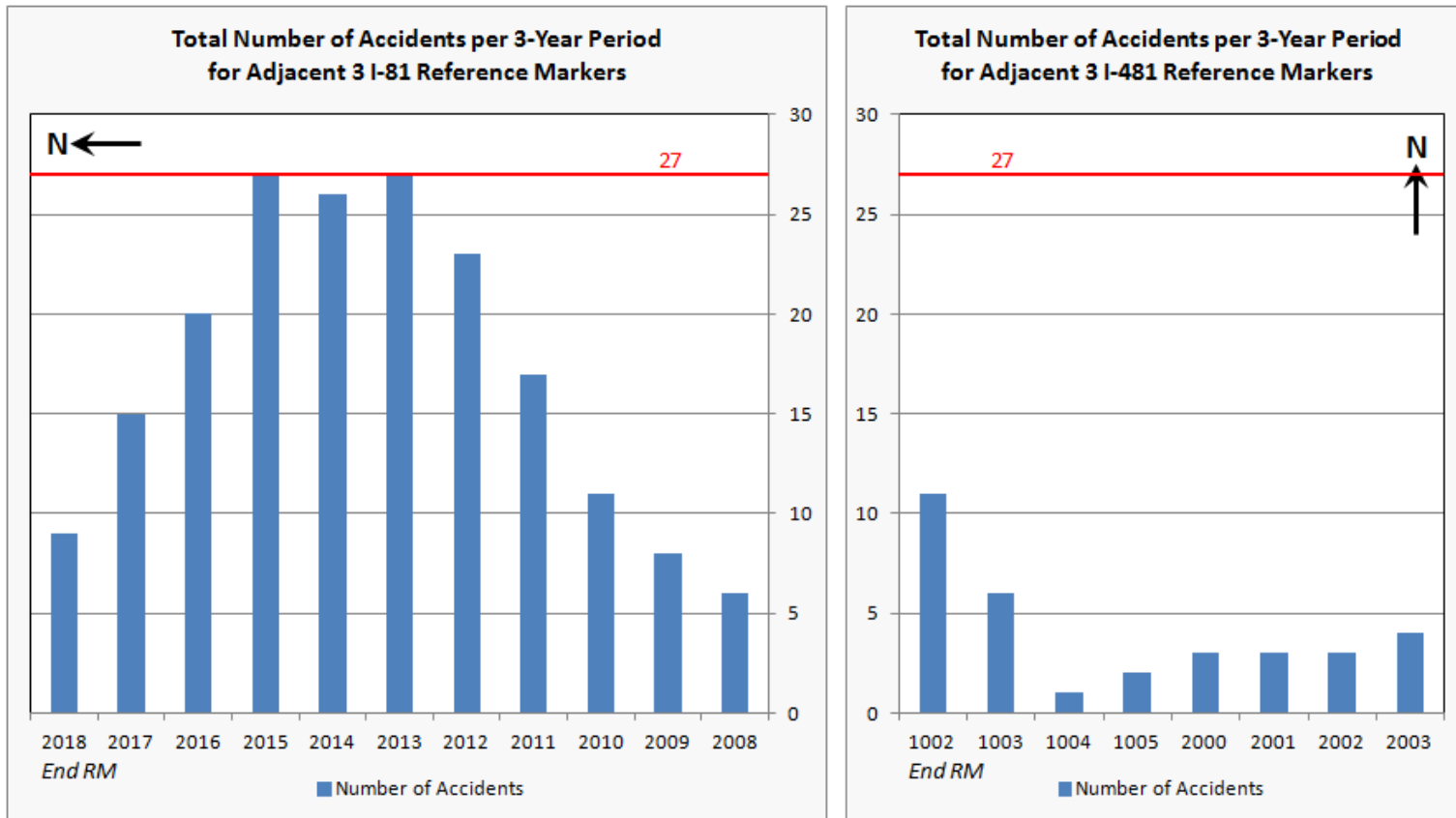


Figure 3

I-81 Viaduct Project – Non-Standard Features



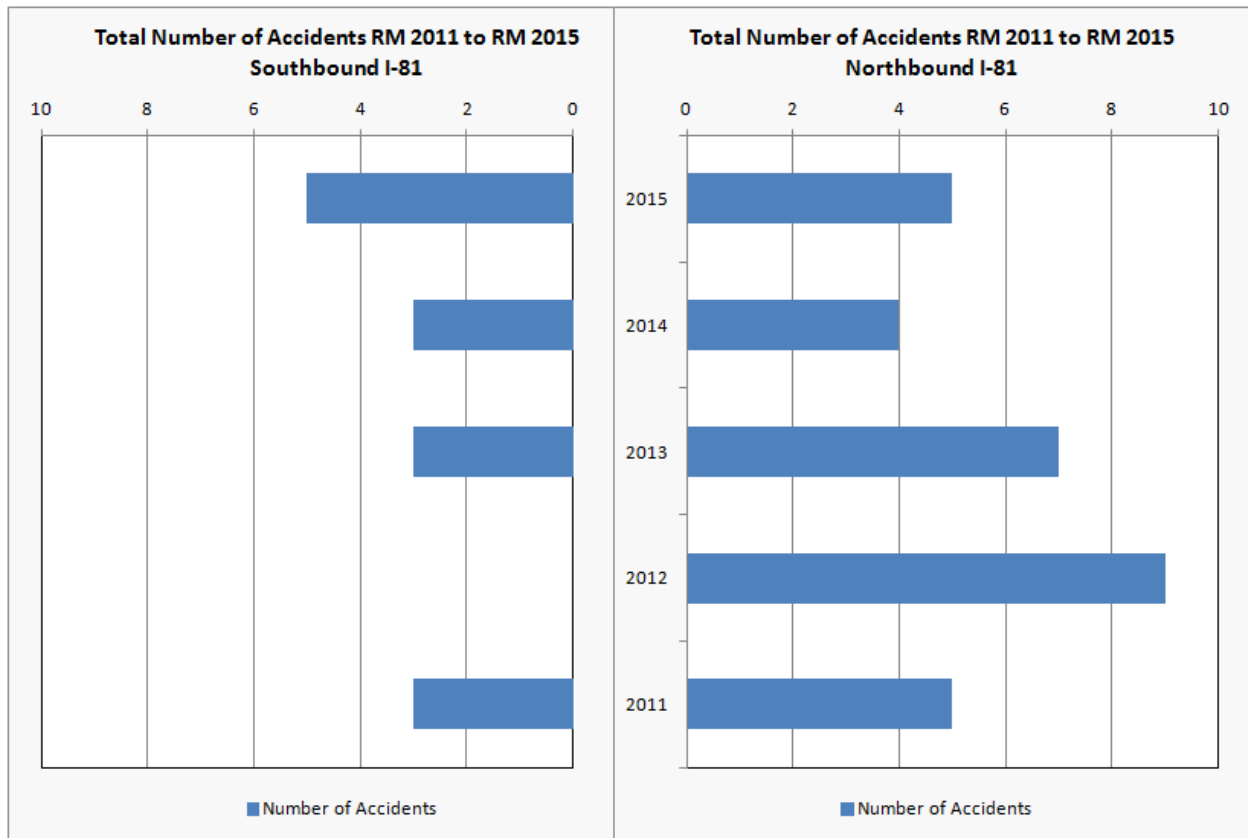
Legend:

- Shoulder Width
- Median Width
- Stopping Sight Distance
- Curve Radius
- Superelevation
- Vertical Grade

E. BRIGHTON AVE.

AINSLY DR.

Figure 4



year analysis period. Most of the accidents in the northbound direction occurred at RM 2012 and RM 2013 at the beginning of the non-standard curve radius segment. The accident rates in the northbound direction of RM 2011 to RM 2015 were calculated to be 2.97, 1.78, and 1.29 ACC/MVM for all types of accidents, wet-road accidents, and fixed-object accidents, respectively. These are 2.7 to 4.3 times the statewide averages. (See Table 1.) Although not related to a non-conforming feature, the southbound accident rates are also high – 1.42, 1.02, and 1.12 ACC/MVM for all, wet-road, and fixed-object accidents, respectively. These are 1.3 to 4.7 times the statewide averages.

Table 1. Accident Numbers and Rates – RM 2011 to RM 2015

Reference Marker	Number of Accidents					
	Southbound			Northbound		
	All Types	Wet Road	Fixed Object	All Types	Wet Road	Fixed Object
2015	5	3	3	5	3	1
2014	3	3	3	4	2	3
2013	3	1	2	7	4	4
2012	0	0	0	9	6	3
2011	3	3	3	5	3	2
Total	14	10	11	30	18	13

	Accident Rate (ACC/MVM)					
	Southbound			Northbound		
	All Types	Wet Road	Fixed Object	All Types	Wet Road	Fixed Object
Calculated	1.42	1.02	1.12	2.97	1.78	1.29
New York Statewide Average	1.09	0.22	0.30	1.09	0.22	0.30
Higher than Statewide Average?	Y	Y	Y	Y	Y	Y

Of the 30 accidents in the northbound direction, 20 occurred between RM 2012 and RM 2014 where the curve radius is non-standard. Of these 20 accidents, 9 were likely unrelated to the non-standard feature – more attributable to following too closely, speeding, or inclement weather conditions than to roadway geometry. However, another 9 accidents were identified to be potentially attributable to the non-standard feature, and 3 others could not be eliminated from being attributable to the non-standard feature. Of the 12 accidents potentially related to the non-standard curve between RM 2012 and RM 2014, 9 (75 percent) were fixed-object accidents, and 4 (33 percent) resulted in injuries. Seven (7) accidents (58 percent) occurred on slippery pavement (i.e., in wet, snowy, or icy conditions) and 6 accidents (50 percent) occurred in low-light conditions (i.e., at dusk, dawn, or night). It should be noted that the relatively high percentages of fixed-object, wet-road, and nighttime accidents are prevalent throughout the length of I-81 between RM 2011 and RM 2015 regardless of roadway geometry or travel direction. This is partially reflected in the accident information provided in Table 1.

A horizontal alignment improvement (i.e., C 40, according to NYSDOT's July 2013 PIES – Reduction Factor Report) would result in approximately a 30 percent decrease in the 12 accidents potentially related to the non-standard curve radius between RM 2012 and RM 2014. The improvement would result in an estimated reduction of 1.8 accidents at RM 2012, 1.2 accidents at RM 2013, and 0.6 accident at RM 2014.

Conclusion

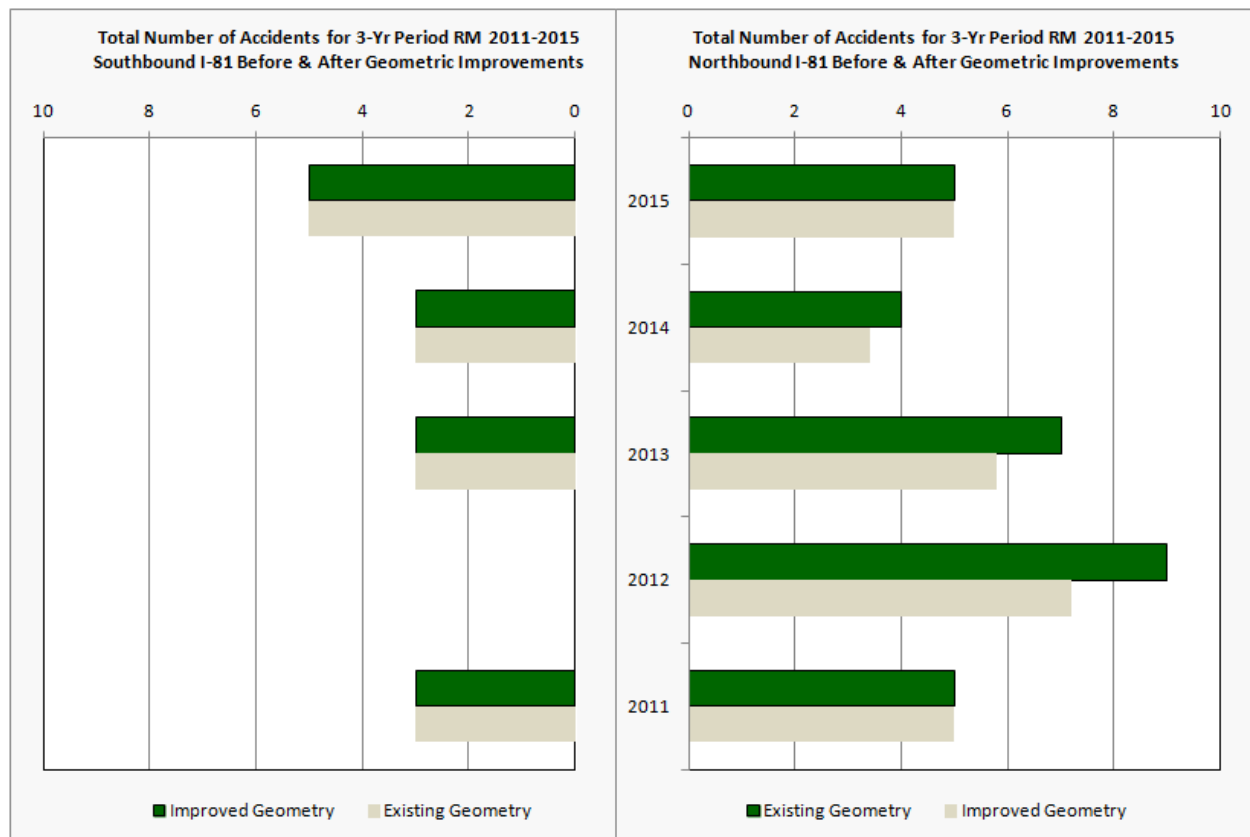
In the I-81 Viaduct south interchange area, 90 accidents occurred during the three-year analysis period – 68 on I-81 between RM 2006 and RM 2018, 18 on I-481 between RM 1000 and RM 2003, and 4 with reference markers unknown. Although both directions of I-81 were calculated to have higher than statewide average overall, wet-road, and fixed-object accident rates, only the small portion of I-81 in the northbound direction between RM 2012 and RM 2014 was identified to have a non-standard feature – a

sub-standard curve radius. Based on a detailed examination of police reports, most (60 percent) of the 20 accidents that occurred on northbound I-81 between RM 2012 and RM 2014 were found to be potentially related to the non-standard curve. Improving the horizontal alignment at the curve would decrease the number of accidents in the area during a three-year period by approximately 3.6 based on NYSDOT's accident reduction factors. The 30 percent decrease in accidents at the curve would effect a 4 percent decrease in accidents in both directions combined along I-81 in the entirety of the south interchange area.

It should be noted that fixed-object, wet-road, and nighttime accidents are high throughout the south interchange area. Preliminary accident analysis for the I-81 segment suggests that speeding, slippery pavement, and inadequate lighting could be primary and/or contributing factors to accidents throughout the area, including along the non-standard curve.

Three-year accident totals in the RM 2011 to RM 2015 area are provided in Figure 5 for existing conditions and for future conditions with the elimination of the non-standard curve.

Figure 5



I-81 Southbound
at Court Street Weaving Area

ACCIDENT SUMMARY SHEET

ROUTE: 81/ **LOCATION:** Syracuse, New York
MUNICIPALITY: _____ **COUNTY:** _____
TIME PERIOD COVERED: 7/1/2010 - 6/30/2013 **REFERENCE MARKERS / NODES:** 81/ 3303 2006 - 81/ 3303 3066
REMARKS: SB Accidents at Court Street Weave - RM 2060 to RM 2056 **DATE:** 3/10/2015

TIME OF DAY			# ACC	%	DIRECTION		# ACC	%	DIRECTION		# ACC	%	
6 AM - 10 AM			21	41.2%	North		0	0.0%	Northeast		0	0.0%	
10 AM - 4 PM			16	31.4%	South		98	100.0%	Northwest		0	0.0%	
4 PM - 7 PM			8	15.7%	East		0	0.0%	Southeast		0	0.0%	
7 PM - 12 AM			3	5.9%	West		0	0.0%	Southwest		0	0.0%	
12 AM - 6 AM			3	5.9%	Total		98			Unspecified		0	0.0%
Unspecified			0	0.0%									
Total			51		ACCIDENT TYPE		# ACC	%	ACCIDENT TYPE		# ACC	%	
WEATHER			# ACC	% <td colspan="2">Rear End</td> <td>33</td> <td>64.7%</td> <td colspan="2">Pedestrian</td> <td>0</td> <td>0.0%</td>	Rear End		33	64.7%	Pedestrian		0	0.0%	
Clear			25	49.0%	Overtake		8	15.7%	Bicycle		0	0.0%	
Cloudy			12	23.5%	Right Angle		1	2.0%	Parked Vehicle		0	0.0%	
Rain			2	3.9%	Left Turn		0	0.0%	Backing		0	0.0%	
Snow			11	21.6%	Right Turn		0	0.0%	Run Off The Road		0	0.0%	
Sleet/Hail/Freezing Rain			0	0.0%	Fixed Object		5	9.8%	Animal		1	2.0%	
Fog/Smog/Smoke			0	0.0%	Head On		0	0.0%	Other		2	3.9%	
Unspecified			1	2.0%	Sideswipe		0	0.0%	Unspecified		1	2.0%	
Total			51		Total		51						

SURFACE				# ACC	%	ACCIDENT SEVERITY				# ACC	%
Dry				36	70.6%	Fatal				0	0.0%
Wet				5	9.8%	Injury				8	15.7%
Mud/Slush				0	0.0%	Property Damage				43	84.3%
Snow/Ice				9	17.6%	Non-Reportable				0	0.0%
Unspecified				1	2.0%	Total				51	
Total				51							

TIME OF YEAR				# ACC	%	TYPE OF VEHICLE				# ACC	%
Winter (Dec-Feb)				17	33.3%	Passenger Cars				99	100.0%
Spring (Mar-May)				12	23.5%	Commercial Vehicles				0	0.0%
Summer (Jun-Aug)				8	15.7%	Total				99	
Fall (Sep-Nov)				14	27.5%						
Total				51							

DAY OF WEEK				# ACC	%	LIGHT CONDITION				# ACC	%
Sunday				5	9.8%	Daylight				41	80.4%
Monday				5	9.8%	Dawn/Dusk				1	2.0%
Tuesday				6	11.8%	Night				8	15.7%
Wednesday				10	19.6%	Unspecified				1	2.0%
Thursday				8	15.7%	Total				51	
Friday				8	15.7%						
Saturday				9	17.6%						
Total				51							

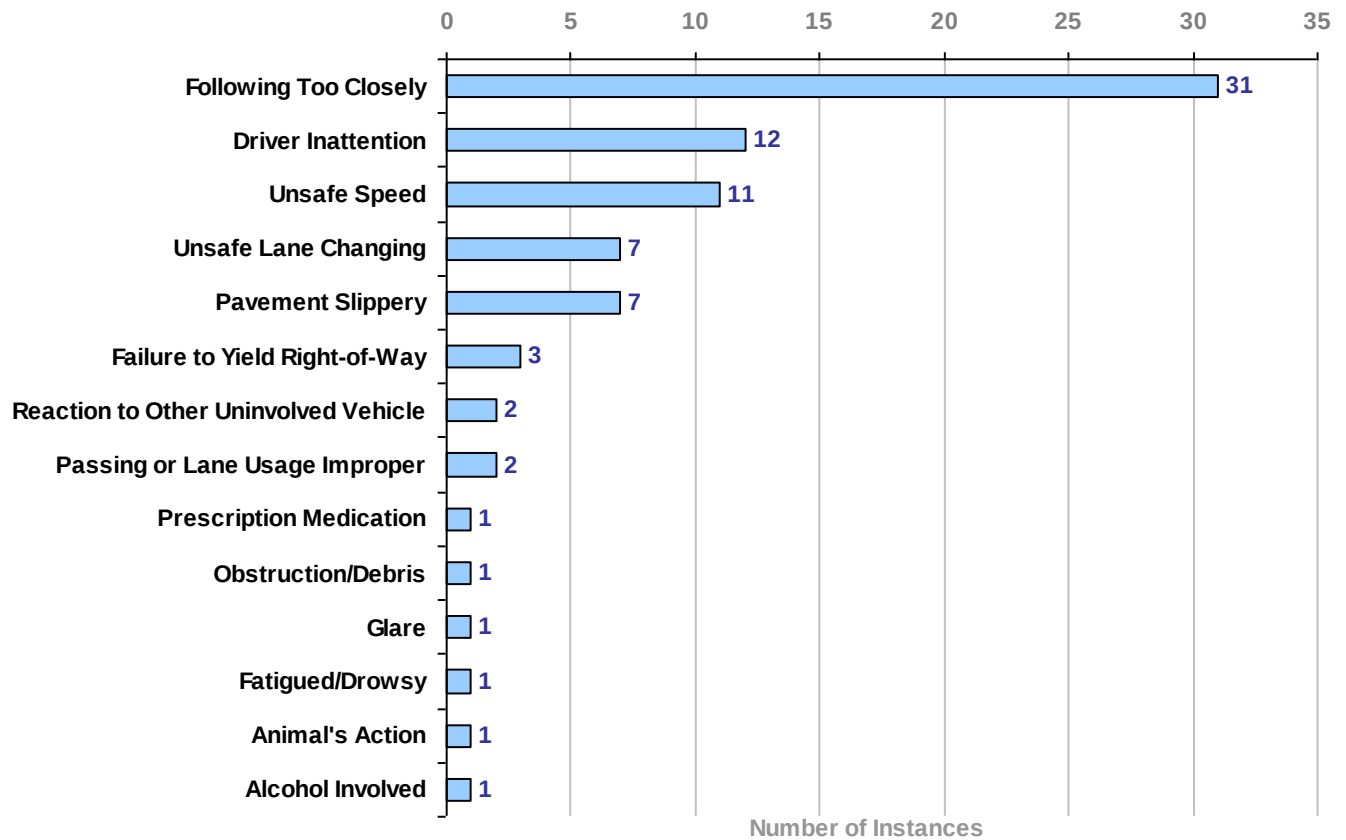
SUMMARY OF ACCIDENT SEVERITY BY YEAR:

	2010	2011	2012	2013
Fatal Accidents	0	0	0	0
Injury Accidents	1	3	4	0
Property Damage Accidents	4	8	17	14
Non-Reportable Accidents	0	0	0	0
Total Accidents	5	11	21	14

HSA CHARTS

ROUTE: 81/ LOCATION: Syracuse, New York
TIME PERIOD COVERED: 7/1/2010 - 6/30/2013 REFERENCE MARKERS / NODES 81/ 3303 2006 - 81/ 3303 3066
REMARKS: SB Accidents at Court Street Weave - RM 2060 to RM 2056 DATE: 3/10/2015

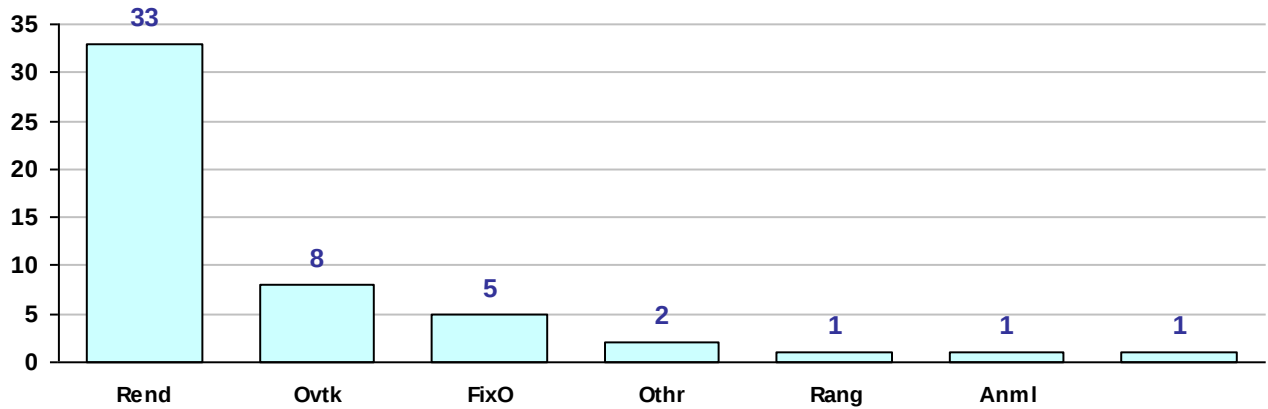
ACCIDENT CONTRIBUTING FACTORS



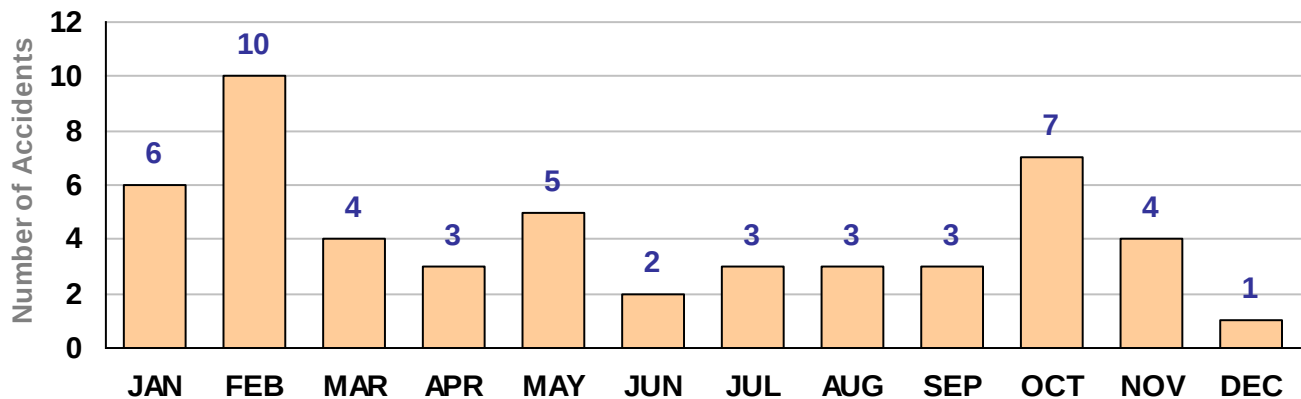
HSA CHARTS

ROUTE: 81/ LOCATION: Syracuse, New York
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 REMARKS: SB Accidents at Court Street Weave - RM 2060 to RM 2056 DATE: 3/10/2015

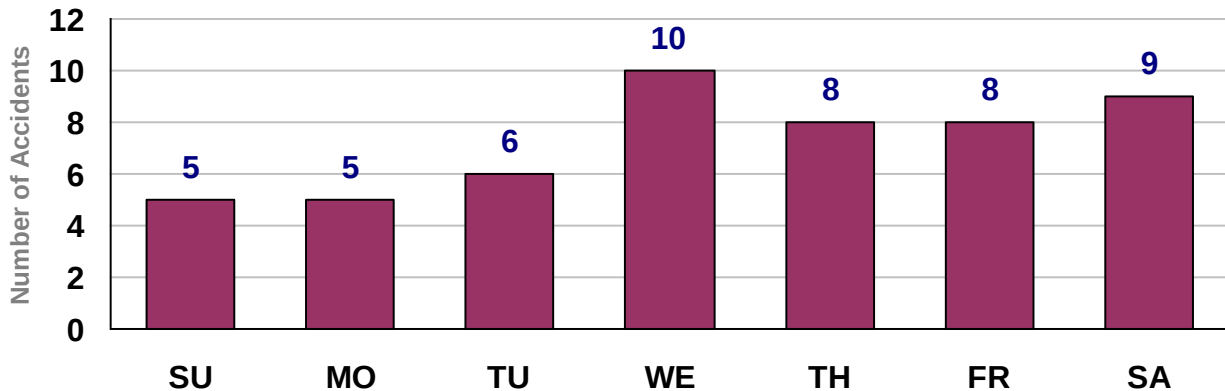
NUMBER OF ACCIDENTS BY TYPE



ACCIDENTS BY MONTH



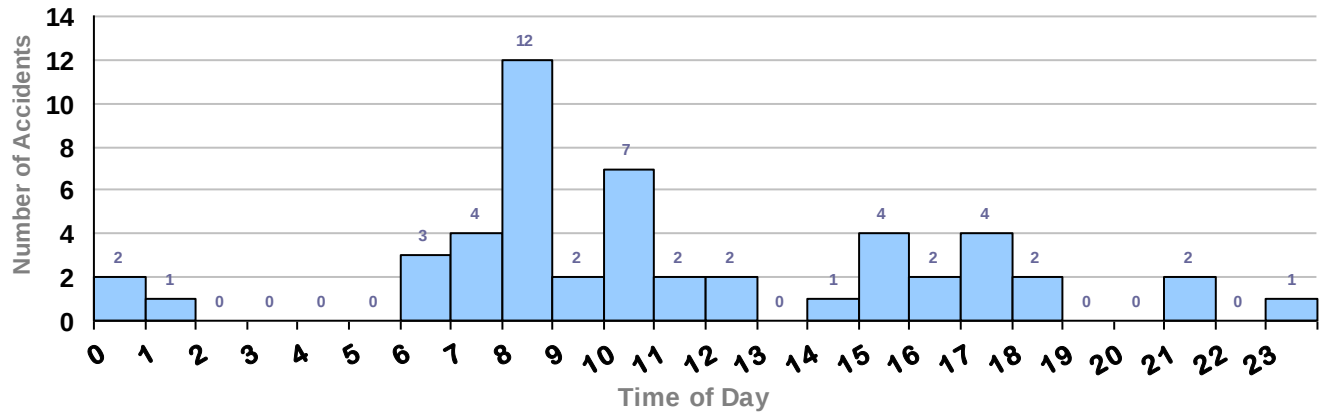
ACCIDENTS BY DAY OF WEEK



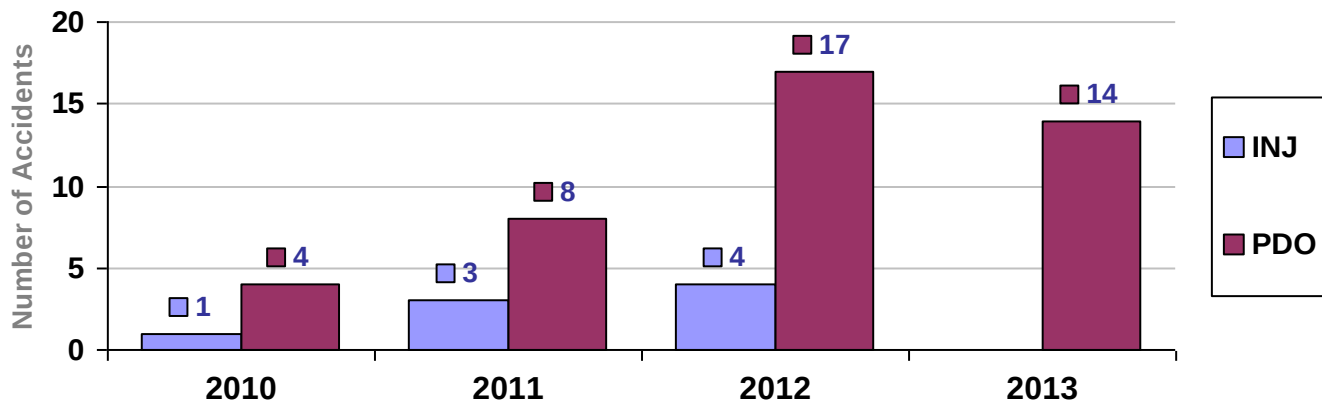
HSA CHARTS

ROUTE: 81/ LOCATION: Syracuse, New York
 TIME PERIOD COVERED: 7/1/2010 - 6/30/2013 REFERENCE MARKERS / NODES 81/ 3303 2006 - 81/ 3303 3066
 REMARKS: SB Accidents at Court Street Weave - RM 2060 to RM 2056 DATE: 3/10/2015

ACCIDENTS BY TIME OF DAY



SEVERITY DISTRIBUTION BY YEAR



HSA CHARTS

ROUTE: 81/ LOCATION: Syracuse, New York
 TIME PERIOD COVERED: 7/1/2010 - 6/30/2013 REFERENCE MARKERS / NODES 81/ 3303 2006 - 81/ 3303 3066
 REMARKS: SB Accidents at Court Street Weave - RM 2060 to RM 2056 DATE: 3/10/2015

