

NJ Regional Curve Inventory and Safety Assessment Summary Memorandum

PREPARED FOR: DVRPC & SJTPO
COPY TO: File
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Introduction

In February of 2018, Greenman Pedersen, Inc., supported by subconsultants Jacobs Engineering Group, Inc. (formerly CH2M Hill, Inc.) and MBO Engineering, Inc. (hereafter referred to as the GPI Team), initiated work under a contract with the Delaware Valley Regional Planning Commission (DVRPC) and South Jersey Transportation Planning Organization (SJTPO) for the purpose of 1) curve advisory speed evaluations on county and municipal roadways in the New Jersey sub-regions to improve driver safety by studying horizontal curves and determining travel advisory speeds consistent with criteria set forth in the 2009 Manual for Uniform Traffic Control Devices (MUTCD), and 2) using the newly collected curve data and New Jersey crash data, identify curves with over-represented crash trends using a New Jersey Department of Transportation (NJDOT)-approved criteria, to be improved with Federal Highway Safety Improvement Program (HSIP) funds.

This project was conducted as a collaborative effort between DVRPC and SJTPO, and closely coordinated with NJDOT and Federal Highway Administration – New Jersey Division (FHWA-NJ). Additionally, it was performed as part of a program of three projects, conducted for the purpose of completing this scope of work for curves on all State, US, Interstate, County and Municipal routes (of functional classification minor collector and higher), within the state of New Jersey.

This memo summarizes project activities and associated deliverables developed through this contract.

Detailed Scope of Work and Deliverables

During delivery of the contract, the GPI Team performed the following activities:

Task 1 - Curve Advisory Speed Evaluations

In accordance with current MUTCD and NJDOT approved guidelines and requirements relative to horizontal curve advisory speeds for roadways, the GPI Team performed a curve assessment for curves on county and municipal routes with functional classification of collector and higher in the

DVRPC and SJTPO regions utilizing Rieker, Inc.'s Curve Advisory Reporting Service (CARS). CARS combines an electronic version of a ball-bank indicator with an internal GPS, integrated software and a tablet computer, to automatically and accurately measure and record the radius, length and superelevation of each curve and calculate the recommended/required curve advisory speed and sign placement for each curve to meet current MUTCD requirements. The data collected in the field auto-saves to the secure Rieker data portal to be used for post-processing at the office and allows the driver and field technician to continuously survey miles of road without stopping. Roadway telemetry is recorded to a tablet computer as a permanent record for later analysis using the CARS software. Additionally, the curve information can be geo-referenced using the counties' linear referenced road layers so that the advisory speed evaluations can be delivered in a format compatible with existing county asset management systems.

The NJDOT's NJ_FC_Street_Name_11_01_13 functional classification GIS layer was used to identify the routes to be inventoried as part of this project. The total centerline mileage was created through the ArcGIS "Calculate Geometry" tool, which calculated the length of each identified road segment into US Miles based on the native coordinate system of the functional class; NAD 83 State Plane New Jersey FIPS 2900 Feet. A summary mileage table, excluding state routes, toll routes & rural local and urban local routes, was created and categorized by County, DVRPC, SJTPO and the combined region evaluated under this contract. Table 1 below, summarizes the county and municipal routes of function classification minor collector or higher within the project area: 500 Series, 600 Series, 700 Series or Local Roads.

Table 1: Centerline Mileage of County and Municipal Routes

	Routes (County and Municipal)				Total CL Mileage
MPO / County	500 Series	600 Series	700 Series	Local Roads	
DVRPC	454.64	775.84	86.38	387.34	1704.2
Mercer	100.59	82.12	0.00	168.54	351.25
Burlington	172.30	282.91	0.00	79.74	534.95
Camden	84.31	182.53	83.67	107.46	457.97
Gloucester	97.44	228.28	2.71	31.60	360.03
SJTPO	333.82	596.25	11.8	177.4	1119.27
Atlantic	162.24	149.71	1.87	103.52	417.34
Cape May	22.50	128.25	0.00	30.65	181.4
Cumberland	93.88	193.02	9.93	38.52	335.35
Salem	55.20	125.27	0.00	4.71	185.18
Total CL Mileage by Route Type:	788.46	1372.09	98.18	564.74	2823.47

To complete the CARS data collection activity GPI used the following approach:

- Two-person field crews (a driver and a technician with the technician operating the computer) collected the curve attribute data and made field notations as appropriate. Data was collected for curves within each of the eight (8) counties as noted in the above table.
- Roadway horizontal curves were driven in both directions a minimum of two (2) times to allow comparison of data points for quality assurance and control.
- Each vehicle was also equipped with a GoPro camera and Distance Measuring Instrument (DMI) which was used to capture video of the roadways with milepost information embedded during the data collection process. The videos documented the curve locations and the presence of existing horizontal curve warning signs. The videos were used as a post-processing tool by GPI for quality control and to obtain additional roadway attributes at the curve locations for inclusion in the systemic analysis and were not identified as a deliverable as a part of the project.

Upon completion of the CARS data collection, the field data was reviewed for accuracy and completeness as part of the QA/QC procedures. Once the data was approved for post-processing, the GPI Team performed the curve analyses of the field data using the CARS software. All identified curves were post-processed in the CARS software, named by SRI and milepost, and curve advisory speed reports were generated.

Task 1 Data Reporting & Support

The curve reports that were created for each identified curve contained the following data: approximate milepost start and end locations based on DMI readout and linear referenced roadway network file, route SRI number, posted speed limit, lateral friction limit (12, 14, or 16 degrees based on 2009 MUTCD), curve direction, point of curvature lat/long coordinates, point of tangent lat/long coordinates, curve radius, curve length, deflection angle, vertical profile classification, superelevation, and CARS calculated advisory speed. A sign placement summary table was also developed for each curve that shows if horizontal curve and chevron signs are optional, recommended or required (based on MUTCD Table 2C-5) as well as chevron spacing distances.

The GPI Team also provided web conference-based support to the counties that will be implementing the associated digital database developed under this project's scope.

Task 1 Deliverables

The primary project deliverables for this task consisted of the curve advisory speed reports for each curve. In addition to the advisory speed reports, an excel summary table and an ArcGIS shapefile containing the Rieker CARS reports data for each analyzed curve including all of the data shown on the CARS reports were provided to DVRPC and SJTPO so that the curves could be easily sorted, grouped and queried for County review in the ArcGIS spatial environment. The deliverables were

provided in electronic format via thumb drive on January 30, 2019. See Attachment A for a copy of the transmittal memo that accompanied the deliverables submitted to DVRPC and SJTPO.

Task 2 – Systemic Roadway Departure Mitigation

Under Task 2, The GPI Team was tasked with providing solutions/assistance to help alleviate roadway departure crashes on the local roadway system (e.g.: county and municipal roads with functional classification of collector and higher). The primary focus was roadway departure crashes on roadway sections with curves, identified as a critical focus area in the New Jersey Strategic Highway Safety Plan.

Using the newly collected curve data from Task 1, New Jersey crash data, etc., the GPI Team conducted a systemic analysis for roadway/lane departure crashes on curves for the county and municipal routes within the DVRPC and SJTPO region. The process followed guidance established by the Federal Highway Administration (FHWA) in the Systemic Safety Project Selection Tool publication FHWA-SA-13-019 (July 2013). The Systemic Tool provides a step-by-step process for conducting systemic safety analysis through which an agency can proactively address the potential for crashes to occur on a system. The systemic safety evaluation process is based on the premise that a focus crash may be more likely to occur if certain risk factors (for example, geometric or traffic characteristics) exist at a given location, even if the location has a limited history of focus crashes. In such locations, using targeted improvements regardless of the presence or frequency of focus crashes can reduce the potential for a crash.

This systemwide crash analysis and systemic safety assessment process involves identifying the risk factors (that is, roadway characteristics) commonly associated with each focus crash type (in this case roadway departure crashes on curves) and then identifying and prioritizing the potential locations across the system based on the presence of those factors. The crash potential of a site is determined by the number of risk factors present at that location. The greater the number of factors indicates a greater potential for a future crash and higher relative priority. This systemic process yields a list of prioritized projects that the supporting agency can work to implement. By conducting a systemic analysis, an agency develops a comprehensive plan for addressing crashes across the entire analysis roadway network. The resulting improvements can then be implemented over time as funding and resources permit.

The following describes the activities performed during Task 2, and the resulting deliverables generated for DVRPC and SJTPO:

Task 2A - Data Summary and Analysis

The GPI Team obtained crash data in electronic database format from the NJDOT that included all crash data for the counties within the DVRPC and SJTPO regions. The crash datasets were reviewed and formatted to perform database screening. Specifically, the data was disaggregated for each region (DVRPC and SJTPO) and along crash emphasis areas for all crashes. To identify trends related to the locations and attributes of total (all severity) crashes within each region for roadway departure

crashes, the GPI Team evaluated and disaggregated the crash data through means of crash data trees, tables, and matrices. This initial summary and screening process focused on a review of system wide total crash (all severity) history to determine common types of crashes and the facilities on which these crashes typically occurred.

Similarly, the GPI team also obtained a copy of the most recent NJDOT Straight Line Diagram (SLD) database, from which roadway characteristics for the curves identified in Task 1 could be obtained. This database was converted into GIS format for use in the systemic safety analysis. While most roadway data needed to conduct a typical systemic analysis was available in this database, some supplemental data collection was required. Additional roadway data attributes for the identified curve locations was collected using desktop methods including Google Earth and the GoPro video logs from Task 1.

The systemic process requires that both crash and roadway data for the system be available and that they be cross-referenced geospatially and in the same coordinate system. Once both the crash database and roadway inventory database were complete, the two were joined for use in the systemic evaluation of lane departure crashes on curves within the two regions.

Task 2A deliverables included focus crash type summaries including crash trees, emphasis area matrices and emphasis area tables. See Attachment B for the memorandum submitted documenting the Task 2A deliverables.

Task 2B - Systemic Analysis

The GPI Team used the databases developed in Task 2A to conduct systemic analysis of roadway departure on curves. The systemic approach involves evaluating the crash history for focus crash types, in this case roadway departure crashes at curves. Risk factors were identified by documenting the most common roadway characteristics associated with the curves where crashes had been recorded within the two regions. Additionally, the Highway Safety Manual and NCHRP 500 Series Reports were referenced to identify and validate the selection of contributing risk factors commonly associated with roadway departure crashes at curves. Based on this initial list, DVRPC, SJTPO and the Counties provided input and confirmed the risk factors that were then used for the systemic review of their facilities for roadway departure crashes.

The GPI Team then screened all curves identified in Task 1 for the identified risk factors. This screening resulted in a list of locations, irrespective of crash history, with similar characteristics as to those where crashes had occurred. Each curve was then scored based on the number of risk factors present. The more risk factors present, the greater the potential for roadway departure crashes at the subject curve. The end result was a listing of curve locations in spreadsheet format with priority based on the magnitude of risk factors present.

Task 2B Deliverables included Horizontal Curve Risk Factor Analysis and Identification Memoranda and Risk Factor Scoring Tables (in Excel format) for both DVRPC and SJTPO regions. See Attachment

C for the Horizontal Curve Risk Factor Identification Memoranda and Risk Factor Scoring Tables developed for each region.

Task 2C - Identification of Low-Cost Countermeasures

Once a priority listing of curves was identified, the GPI Team utilized information contained in the National Crash Modification Clearinghouse, Highway Safety Manual, NCHRP 500 Series Reports, NHTSA's Countermeasures That Work, and FHWA's Twenty Proven Safety Countermeasures to develop a draft list of safety countermeasures focusing on potential improvement projects to address roadway departure crashes. The list included a brief description of the countermeasure, anticipated effectiveness, and an estimate of cost to implement.

The DVRPC, SJTPO and the Counties provided input into the final list of proposed countermeasures which was then used as the basis for developing curve-specific recommendations for mitigating roadway departure crashes. To facilitate a logical application of the treatments to the curves, a project development decision tree was developed specific to each region. Through application of the project development decision logic, it was possible to identify one or more specific countermeasures for application at each curve, based on the various risk factor conditions. The end result of the project development logic was a program of projects for each region. These projects are documented in Systemic Safety Project Recommendation spreadsheets that included prioritized lists of project recommendations comprised of the safety countermeasures determined to be the most appropriate for addressing the characteristics with potential to contribute to future crashes present at each curve.

Task 2C deliverables included a Countermeasure Selection Memorandum (see Attachment D) and individual Project Development Logic Trees (see Attachment E), Project Recommendation Tables (see Attachment F), and Project Recommendation Table User Guides (see Attachment G) for DVRPC and SJTPO. The Project Recommendation Tables were also provided to both agencies in Excel format to allow DVRPC, SJTPO, and the Counties the flexibility to select and implement, at their discretion, the countermeasures in a manner that best fits their individual programs, resources, and funding availability.

ATTACHMENTS:

Attachment A – Task 1 Deliverable Memo

Attachment B – Focus Crash Type Summary Memorandum

Attachment C – Horizontal Curve Risk Factor Analysis and Identification Memoranda and Risk Factor Scoring Tables

Attachment D – Countermeasure Selection Memorandum

Attachment E – Project Development Logic Trees

Attachment F – Project Recommendation Tables

Attachment G – Project Recommendation Table User Guides

Attachment A

Task 1 Deliverable Memo

To: DVRPC & SJTPO
Project: NJ Regional Curve Inventory and Safety Assessment
Date: January 30, 2019
Subject: Task 1 Deliverables (on attached thumb drive)

The GPI Team completed Task 1 (Curve Advisory Speed Evaluations) relative to the above referenced project. Each County is receiving the following digital project deliverables:

- **Rieker CARS reports** in PDF format for each analyzed horizontal curve including the approximate milepost start and end locations based on the linear referenced roadway network file, route SRI number, posted speed limit, lateral friction limit (12, 14, or 16 degrees based on 2009 MUTCD), curve direction, point of curvature lat/long coordinates, point of tangent lat/long coordinates, curve radius, curve length, deflection angle, vertical profile classification, superelevation, and CARS calculated advisory speed. A sign placement summary table will be included on each report that shows if horizontal curve and chevron signs are optional, recommended or required (based on MUTCD Table 2-C5) as well as chevron spacing distances. The second page of this report contains two Google Streets location maps showing the curve location.
 - The CARS sign placement summary table does not take into account site specific issues, such as crash history, sight distance limitations, etc., that may call for additional horizontal curve warning signs or other warning signs to be installed along the roadway.
 - The CARS sign placement summary table does not take into account adjacent curves that are within 600 feet where Reverse Curve, Reverse Turn and Winding Road signs may be needed. When sign design activities are being performed, Section 2C.07 of the 2009 MUTCD manual should be referenced for correct horizontal curve signage in these situations.
 - The CARS sign placement summary table does not take into account for signing at ramp or exit locations. Horizontal curve signing in advance and at ramp/exit locations will need to be determined during design consistent with County practices and guidance contained in the MUTCD.
 - Determinations on the need and/or use of large arrow signs, combination horizontal alignment/intersection signs, or custom curve signs should be reviewed as part of sign design.
 - Existing horizontal curve warning signs along roadways were not inventoried or reviewed as part of this project and should be evaluated as part of sign design.
- Rieker CARS reports **Excel Summary** table including all of the data for each analyzed curve shown on the CARS reports so that the curves can be easily sorted, grouped and queried for County review
- An **ArcGIS shapefile** containing the Rieker CARS reports data for each analyzed curve which included all of the data shown on the CARS reports so that the curves can be easily sorted, grouped and queried for County review in the ArcGIS spatial environment

Based on our contracted scope of work, GPI will provide up to a total of two (2) days of web conference-based technical support to the Counties to review the information and to answer questions. The sessions will be coordinated to include more than one (1) County at a time so as to maximize our support.

The thumb drive with this package includes the four (4) counties that are within your New Jersey region.

Please contact Erich Hizer at GPI if you have any questions.

GIS Data Notes:

Item Description:

County Curve Data – Curve data was collected for each represented county using the CARS system in 2018. All fields related to the signage of the curve can be found on the corresponding PDF report. Necessary fields have been added to an excel report to easily sort, group and query data.

Description of Data:

GPI utilized a system recently developed by Rieker, Inc., known as the Curve Advisory Reporting Service (CARS), to collect curve data along County owned/maintained roadways in 2018. The CARS system consisted of an electronic version of a ball-bank indicator with an internal GPS, integrated software and a laptop computer to automatically record road telemetry for later analysis. Each curve was driven in both directions, twice, to ensure valid data recordings.

The collected roadway field data was then loaded into the CARS Web Portal Application to determine the appropriate horizontal curve advisory speeds. The included data are the results of the analysis. Each curve evaluated has been named according to the SRI and the approximate milepost start and end locations based on the linear referenced roadway network file. Each curve was driven two times in each travel direction. Each travel direction is therefore represented by two separate data lines. The pass that was chosen to represent the necessary signage for the curve based on the CARS system is listed as YES under selected pass.

Field Descriptions:

Curve_Name – The name of the curve derived from the SRI and the approximate milepost start and end locations based on the linear referenced roadway network file.

Pass_Num – Each curve was driven a total of twice in each travel direction. This number corresponds to the order that the pass is listed on the corresponding PDF report for the curve.

Pass_Selc – Each curve was driven a total of twice in each travel direction. The pass that was chosen to represent the necessary signage for the curve based on the CARS system is listed as YES.

NFLID_Start – The SRI that the curve begins on.

NFLID_End – The SRI that the curve ends on.

CTL_Begin – The approximate milepost of the start of the curve based on the linear referenced roadway network file.

CTL_End – The approximate milepost of the end of the curve based on the linear referenced roadway network file.

Posted_Sp – The posted speed limit of the road. Curves that fall within two different speed zones were analyzed with separate reports using the appropriate approach speed.

Sign – The direction of curvature according to the travel direction.

Travel_Dir – The travel direction.

Latitude – The latitude of the start of the curve.

Longitude – The longitude of the start of the curve.

Latitude1 – The latitude of the end of the curve.

Longitude1 – The longitude of the end of the curve.

Curve_Radi – The radius of the curve.

Curve_Leng – The length of the curve.

Calc_Min_A – The calculated minimum advisory speed for the curve.

Rec_Adv_Sp – The recommended advisory speed for the curve.

Deflection – The deflection angle of the curve.

Elevation – The elevation at apex for the curve.

Curve_Class – The curve classification.

Curve_Grad – The curve grade.

GPS_Fit – The fit represents how well the actual curve aligns with the chosen model (parabolic or circular).

Average_Sp – The average test speed of the field collection.

Differenti – The difference between the posted speed limit and proposed advisory speed.

Curve_Sign – The recommended curve sign based on the CARS analysis.

Curve_SI_1 – A description of if the curve sign is recommended, required, or not needed.

Advisory_S – The recommended advisory speed plaque for the curve.

Speed_Sign – A description of if the advisory plaque is recommended, required, or not needed.

Chevron_SI – A description for chevron spacing if needed.

Chevron_Sp – A description of if chevrons are recommended, required, optional or not needed.

Chevron_Re – States whether the recommended advisory speed is at or above the posted speed limit.

Attachment B

Crash Summaries and Data References Memorandum

SJTPO Region, County and Municipal Routes

Task 2A Crash Summaries and Data References

PREPARED FOR: DVRPC & SJTPO
COPY TO: File
DATE: April 20, 2020
REVISION NO.: Original

Under Task No. 2, Systemic Roadway Departure, the GPI Team conducted a safety review of the New Jersey (NJ) local roadway system in the South Jersey Transportation Organization (SJTPO) and Delaware Valley Regional Planning Commission (DVRPC) regions. This initial screening process focused on a review of system wide total crash (all severity) history to determine the types of crashes that are overrepresented and the facilities on which these crashes typically occur within the two study regions. This memorandum has been developed to accompany the submittal of the Task 2A – Crash Summaries/ Analysis deliverables. Included in this memorandum are brief descriptions of the deliverables and documentation of the sources of the data used to compile the deliverables.

1 Task 2A Deliverables

information compiled during execution of Task 2A. Specifically, the Task 2A deliverables include:

Focus crash type summaries for total (all severity) crashes for each of the two study regions. The submitted files include:

- **Crash Trees** - for the NJ local roadway system that disaggregate the data statewide and by Metropolitan Planning Organization (MPO) by: state vs. local, divided vs. undivided, intersection vs. segment, curve, speed limit, and lane departure. Includes detailed breakdown by Fatal, Fatal + Injury, and All crash severities.
- **EA Matrices** – for all emphasis areas by Fatal, Fatal and Injury, and All Crashes, showing the overlap of crashes relationships to all emphasis areas. (e.g. 42.8% of motorcycle crashes can also be included in aggressive driver EA)
- **EA Tables** – summarizing crashes by safety emphasis area and severity by MPO, and comparing percentage representation of EAs to national data. Includes detailed breakdown by Fatal, Fatal + Injury, and All crash severities.

These files are being submitted in both original and PDF format.

The data sources used in the production of the tables and figures for the Task 2A Deliverables are as follows.

- National Fatalities Percentages – National Highway Traffic Safety Association (NHTSA) and US Department of Transportation
- Crash Data – New Jersey Department of Transportation (NJDOT) and NJ Voyager

- Emphasis Area Definitions - SQL query definitions (from NJDOT)
- Roadway Data – NJDOT Straight Line Diagram (SLD) Database
- New Jersey Strategic Highway Safety Plan (SHSP)
- New Jersey Highway Safety Improvement Program (HSIP) Manual

2 Data References

Crash Data: 2012-2016

- NJDOT Bureau of Transportation Data and Safety (BTDS). *2012-2016 Raw Crash Data and Master File Layout*. Accessed 10 April 2018. <http://www.gpiprojects.com/HSIP>
- NJDOT BTDS. *Safety Voyager Geodatabase 2012-2016*. Personal Communication [fileshare.gpinet.com] with CH2M HILL. 19 April 2018.

Roadway and Traffic Information

- NJDOT BTDS. *Geocoded SLD Database*. Personal Communication [fileshare.gpinet.com] with CH2M HILL. 2 April 2018.
- NJDOT BTDS. *TMS Database*. Accessed 21 June 2018. <http://www.gpiprojects.com/HSIP>
- NJDOT BTDS. *ADT Flow Layers*. Personal Communication [email] with CH2M HILL. 12 June 2018.

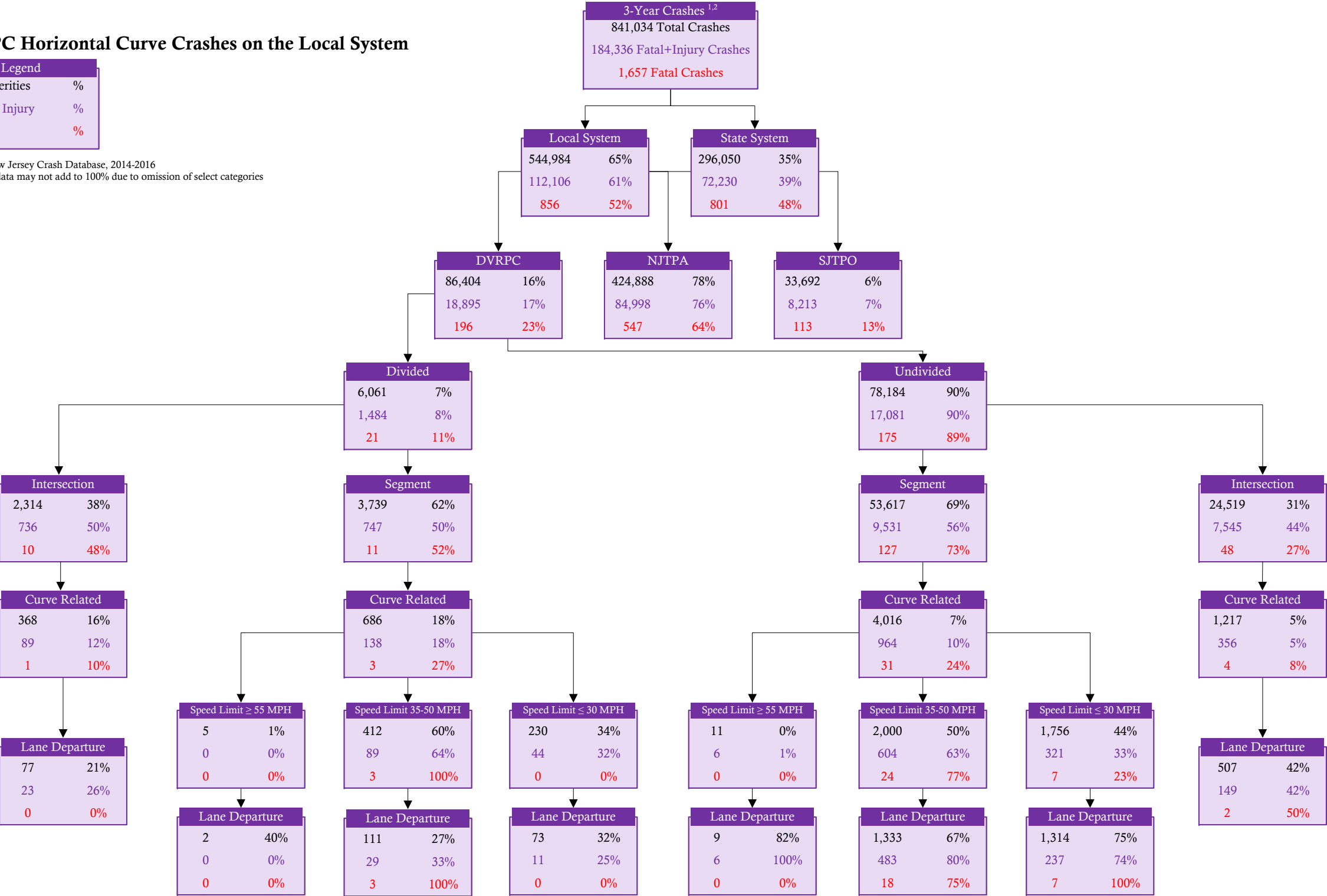
Reports

- NJDOT. *New Jersey Strategic Highway Safety Plan*. August 2015.
- NJDOT. *New Jersey Highway Safety Improvement Program Manual*. September

DVRPC Horizontal Curve Crashes on the Local System

Legend	
All Severities	%
Fatal + Injury	%
Fatal	%

¹ Source: New Jersey Crash Database, 2014-2016
² Displayed data may not add to 100% due to omission of select categories



DVRPC Local System Crashes by Safety Emphasis Area and Severity - 2014 to 2016

Safety Emphasis Area ¹	National Fatalities Percentage ²	DVRPC Local System					
		Fatal Crashes		Fatal + Injury Crashes		All Severity Crashes	
		Crashes	Percentage	Crashes	Percentage	Crashes	Percentage
Statewide Crash Totals ³		196		18,895		86,404	
Aggressive Driver	36%	85	43%	8,650	46%	28,902	33%
Drowsy/Distracted Driver	12%	80	41%	10,721	57%	46,921	54%
Heavy Vehicle	12%	15	8%	644	3%	5,719	7%
Impaired Driver	31%	24	12%	1,047	6%	2,805	3%
Intersection	21%	58	30%	8,411	45%	27,432	32%
Lane Departure	52%	98	50%	5,558	29%	30,166	35%
Motorcycle	14%	33	17%	548	3%	744	1%
Old Driver	16%	45	23%	3,869	20%	15,221	18%
Pedestrian/Bicyclist	15%	49	25%	1,489	8%	2,034	2%
Train	1%	2	1%	5	0%	9	0%
Unbelted Occupants	34%	55	28%	1,366	7%	10,289	12%
Work Zone	2%	1	1%	113	1%	617	1%
Young Driver	8%	29	15%	4,271	23%	16,685	19%
On Horizontal Curve ⁴	N/A	39	20%	1,578	8%	6,424	7%

Notes:

¹ Data Definitions Source: New Jersey Department of Transportation, 2017

² From New Jersey Strategic Highway Safety Plan, 2015

³ Columns are not additive due to instances of crashes assigned to multiple emphasis areas

⁴ Not included as an Emphasis Area in the New Jersey Strategic Highway Safety Plan

Fatal Crashes Occurring On Local System - DVRPC															
Emphasis Area		Primary Emphasis Area													
		EA: Aggressive Driver	EA: Drowsy/ Distracted Driver	EA: Heavy Vehicle	EA: Impaired Driver	EA: Intersection	EA: Lane Departure	EA: Motorcycle	EA: Old Driver	EA: Pedestrian/ Bicyclist	EA: Train	EA: Unbelted Occupants	EA: Work Zone	EA: Young Driver	Total
Secondary Emphasis Area	EA: Aggressive Driver	-	46.2%	40.0%	66.7%	57.9%	44.3%	69.7%	45.5%	18.8%	100.0%	42.6%	0.0%	65.5%	43.5%
	EA: Drowsy/ Distracted Driver	42.9%	-	53.3%	41.7%	47.4%	41.2%	51.5%	29.5%	39.6%	0.0%	38.9%	100.0%	37.9%	40.4%
	EA: Heavy Vehicle	7.1%	10.3%	-	0.0%	5.3%	5.2%	0.0%	13.6%	10.4%	0.0%	0.0%	100.0%	0.0%	7.8%
	EA: Impaired Driver	19.0%	12.8%	0.0%	-	15.8%	15.5%	12.1%	6.8%	12.5%	50.0%	14.8%	0.0%	3.4%	12.4%
	EA: Intersection	39.3%	34.6%	20.0%	37.5%	-	20.6%	45.5%	45.5%	22.9%	100.0%	25.9%	100.0%	44.8%	29.5%
	EA: Lane Departure	51.2%	51.3%	33.3%	62.5%	35.1%	-	36.4%	52.3%	6.3%	0.0%	64.8%	100.0%	51.7%	50.3%
	EA: Motorcycle	27.4%	21.8%	0.0%	16.7%	26.3%	12.4%	-	9.1%	2.1%	0.0%	25.9%	0.0%	27.6%	17.1%
	EA: Old Driver	23.8%	16.7%	40.0%	12.5%	35.1%	23.7%	12.1%	-	4.2%	50.0%	11.1%	0.0%	13.8%	22.8%
	EA: Pedestrian/ Bicyclist	10.7%	24.4%	33.3%	25.0%	19.3%	3.1%	3.0%	4.5%	-	0.0%	24.1%	0.0%	10.3%	24.9%
	EA: Train	2.4%	0.0%	0.0%	4.2%	3.5%	0.0%	0.0%	2.3%	0.0%	-	0.0%	0.0%	0.0%	1.0%
	EA: Unbelted Occupants	27.4%	26.9%	0.0%	33.3%	24.6%	36.1%	42.4%	13.6%	27.1%	0.0%	-	0.0%	24.1%	28.0%
	EA: Work Zone	0.0%	1.3%	6.7%	0.0%	1.8%	1.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	0.0%	0.5%
	EA: Young Driver	22.6%	14.1%	0.0%	4.2%	22.8%	15.5%	24.2%	9.1%	6.3%	0.0%	13.0%	0.0%	-	15.0%

Fatal and Injury Crashes Occurring On Local System - DVRPC

Emphasis Area		Primary Emphasis Area													
		EA: Aggressive Driver	EA: Drowsy/ Distracted Driver	EA: Heavy Vehicle	EA: Impaired Driver	EA: Intersection	EA: Lane Departure	EA: Motorcycle	EA: Old Driver	EA: Pedestrian/ Bicyclist	EA: Train	EA: Unbelted Occupants	EA: Work Zone	EA: Young Driver	Total
Secondary Emphasis Area	EA: Aggressive Driver	-	33.9%	44.9%	40.6%	56.9%	38.2%	46.5%	48.9%	20.1%	60.0%	31.5%	46.0%	53.4%	45.8%
	EA: Drowsy/ Distracted Driver	42.0%	-	57.5%	63.2%	54.4%	54.9%	44.9%	57.6%	40.0%	20.0%	50.2%	50.4%	57.6%	56.7%
	EA: Heavy Vehicle	3.3%	3.5%	-	1.2%	3.2%	3.1%	0.4%	3.2%	2.4%	0.0%	2.7%	7.1%	2.0%	3.4%
	EA: Impaired Driver	4.9%	6.2%	2.0%	-	3.6%	12.6%	4.7%	2.2%	5.3%	20.0%	11.0%	10.6%	2.8%	5.5%
	EA: Intersection	55.3%	42.7%	41.6%	28.9%	-	31.2%	42.2%	47.8%	43.9%	60.0%	37.0%	35.4%	47.9%	44.5%
	EA: Lane Departure	24.5%	28.4%	26.4%	67.0%	20.6%	-	29.6%	22.3%	1.1%	20.0%	43.6%	21.2%	27.8%	29.4%
	EA: Motorcycle	2.9%	2.3%	0.3%	2.5%	2.7%	2.9%	-	1.5%	0.8%	0.0%	21.2%	4.4%	1.4%	2.9%
	EA: Old Driver	21.9%	20.8%	19.1%	8.2%	22.0%	15.5%	10.4%	-	14.0%	20.0%	7.5%	21.2%	13.4%	20.5%
	EA: Pedestrian/ Bicyclist	3.5%	5.5%	5.4%	7.5%	7.8%	0.3%	2.2%	5.4%	-	0.0%	30.9%	13.3%	2.4%	7.9%
	EA: Train	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	-	0.0%	0.9%	0.0%	0.0%
	EA: Unbelted Occupants	5.0%	6.4%	5.7%	14.3%	6.0%	10.7%	52.9%	2.6%	28.3%	0.0%	-	10.6%	2.9%	7.2%
	EA: Work Zone	0.6%	0.5%	1.2%	1.1%	0.5%	0.4%	0.9%	0.6%	1.0%	20.0%	0.9%	-	0.5%	0.6%
	EA: Young Driver	26.4%	22.9%	13.0%	11.4%	24.3%	21.4%	10.8%	14.8%	6.8%	20.0%	9.2%	19.5%	-	22.6%

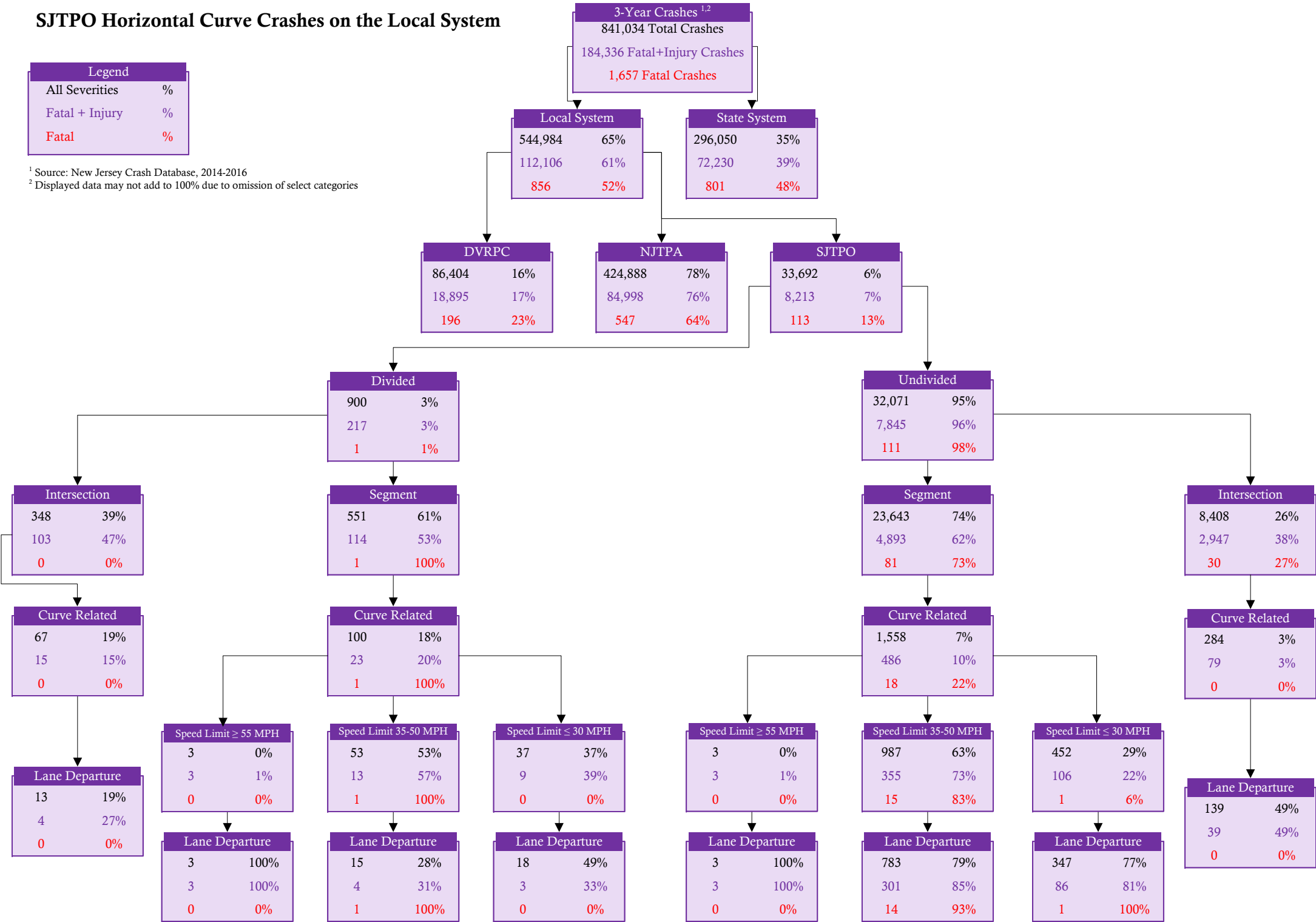
All Crashes Occurring On Local System - DVRPC

Emphasis Area		Primary Emphasis Area													
		EA: Aggressive Driver	EA: Drowsy/ Distracted Driver	EA: Heavy Vehicle	EA: Impaired Driver	EA: Intersection	EA: Lane Departure	EA: Motorcycle	EA: Old Driver	EA: Pedestrian/ Bicyclist	EA: Train	EA: Unbelted Occupants	EA: Work Zone	EA: Young Driver	Total
Secondary Emphasis Area	EA: Aggressive Driver	-	24.8%	21.4%	31.6%	48.3%	20.6%	44.6%	39.1%	18.9%	44.4%	13.9%	30.3%	44.3%	33.4%
	EA: Drowsy/ Distracted Driver	40.3%	-	61.0%	67.8%	54.9%	53.0%	47.8%	57.6%	39.8%	44.4%	45.0%	56.4%	57.4%	54.3%
	EA: Heavy Vehicle	4.2%	7.4%	-	1.6%	5.1%	9.2%	1.2%	4.7%	1.9%	0.0%	5.4%	21.2%	2.6%	6.6%
	EA: Impaired Driver	3.1%	4.1%	0.8%	-	2.6%	6.6%	4.2%	1.3%	5.0%	22.2%	3.7%	3.6%	1.7%	3.2%
	EA: Intersection	45.9%	32.1%	24.5%	25.8%	-	20.6%	40.6%	36.4%	46.0%	66.7%	20.0%	32.6%	36.5%	31.7%
	EA: Lane Departure	21.5%	34.1%	48.5%	70.6%	22.6%	-	30.9%	22.0%	1.0%	22.2%	75.5%	31.3%	26.7%	34.9%
	EA: Motorcycle	1.1%	0.8%	0.2%	1.1%	1.1%	0.8%	-	0.6%	0.9%	0.0%	3.5%	1.0%	0.5%	0.9%
	EA: Old Driver	20.6%	18.7%	12.5%	7.2%	20.2%	11.1%	11.8%	-	13.5%	22.2%	3.6%	20.7%	11.1%	17.6%
	EA: Pedestrian/ Bicyclist	1.3%	1.7%	0.7%	3.6%	3.4%	0.1%	2.4%	1.8%	-	0.0%	5.8%	3.1%	0.9%	2.4%
	EA: Train	0.0%	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	-	0.0%	0.2%	0.0%	0.0%
	EA: Unbelted Occupants	4.9%	9.9%	9.8%	13.4%	7.5%	25.8%	47.7%	2.4%	29.3%	0.0%	-	10.4%	2.7%	11.9%
	EA: Work Zone	0.6%	0.7%	2.3%	0.8%	0.7%	0.6%	0.8%	0.8%	0.9%	11.1%	0.6%	-	0.5%	0.7%
	EA: Young Driver	25.6%	20.4%	7.5%	10.2%	22.2%	14.8%	11.3%	12.2%	7.0%	11.1%	4.3%	14.3%	-	19.3%

SJTPO Horizontal Curve Crashes on the Local System

Legend	
All Severities	%
Fatal + Injury	%
Fatal	%

¹ Source: New Jersey Crash Database, 2014-2016
² Displayed data may not add to 100% due to omission of select categories



SJTPO Local System Crashes by Safety Emphasis Area and Severity - 2014 to 2016

Safety Emphasis Area ¹	National Fatalities Percentage ²	SJTPO Local System					
		Fatal Crashes		Fatal + Injury Crashes		All Severity Crashes	
		Crashes	Percentage	Crashes	Percentage	Crashes	Percentage
Statewide Crash Totals ³		113		8,213		33,692	
Aggressive Driver	36%	55	49%	3,723	45%	10,981	33%
Drowsy/Distracted Driver	12%	42	37%	4,585	56%	17,769	53%
Heavy Vehicle	12%	9	8%	271	3%	1,981	6%
Impaired Driver	31%	10	9%	581	7%	1,498	4%
Intersection	21%	30	27%	3,117	38%	8,947	27%
Lane Departure	52%	73	65%	2,743	33%	12,747	38%
Motorcycle	14%	14	12%	270	3%	358	1%
Old Driver	16%	26	23%	1,703	21%	6,369	19%
Pedestrian/Bicyclist	15%	22	19%	819	10%	1,017	3%
Train	1%	0	0%	1	0%	4	0%
Unbelted Occupants	34%	36	32%	658	8%	3,893	12%
Work Zone	2%	0	0%	67	1%	298	1%
Young Driver	8%	20	18%	1,867	23%	6,416	19%
On Horizontal Curve ⁴	N/A	19	17%	607	7%	2,037	6%

Notes:

¹ Data Definitions Source: New Jersey Department of Transportation, 2017

² From New Jersey Strategic Highway Safety Plan, 2015

³ Columns are not additive due to instances of crashes assigned to multiple emphasis areas

⁴ Not included as an Emphasis Area in the New Jersey Strategic Highway Safety Plan

Fatal Crashes Occurring On Local System - SJTPO

Emphasis Area		Primary Emphasis Area													
		EA: Aggressive Driver	EA: Drowsy/ Distracted Driver	EA: Heavy Vehicle	EA: Impaired Driver	EA: Intersection	EA: Lane Departure	EA: Motorcycle	EA: Old Driver	EA: Pedestrian/ Bicyclist	EA: Train	EA: Unbelted Occupants	EA: Work Zone	EA: Young Driver	Total
Secondary Emphasis Area	EA: Aggressive Driver	-	45.2%	55.6%	50.0%	80.0%	60.3%	78.6%	65.4%	9.1%	0.0%	52.8%	0.0%	60.0%	48.7%
	EA: Drowsy/ Distracted Driver	34.5%	-	44.4%	70.0%	23.3%	41.1%	28.6%	19.2%	31.8%	0.0%	36.1%	0.0%	35.0%	37.2%
	EA: Heavy Vehicle	9.1%	9.5%	-	0.0%	10.0%	9.6%	0.0%	15.4%	4.5%	0.0%	0.0%	0.0%	0.0%	8.0%
	EA: Impaired Driver	9.1%	16.7%	0.0%	-	3.3%	9.6%	7.1%	0.0%	18.2%	0.0%	8.3%	0.0%	5.0%	8.8%
	EA: Intersection	43.6%	16.7%	33.3%	10.0%	-	19.2%	42.9%	57.7%	31.8%	0.0%	13.9%	0.0%	20.0%	26.5%
	EA: Lane Departure	80.0%	71.4%	77.8%	70.0%	46.7%	-	50.0%	57.7%	4.5%	0.0%	77.8%	0.0%	80.0%	64.6%
	EA: Motorcycle	20.0%	9.5%	0.0%	10.0%	20.0%	9.6%	-	15.4%	0.0%	0.0%	13.9%	0.0%	10.0%	12.4%
	EA: Old Driver	30.9%	11.9%	44.4%	0.0%	50.0%	20.5%	28.6%	-	13.6%	0.0%	8.3%	0.0%	15.0%	23.0%
	EA: Pedestrian/ Bicyclist	3.6%	16.7%	11.1%	40.0%	23.3%	1.4%	0.0%	11.5%	-	0.0%	13.9%	0.0%	5.0%	19.5%
	EA: Train	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	0.0%	0.0%	0.0%	0.0%
	EA: Unbelted Occupants	34.5%	31.0%	0.0%	30.0%	16.7%	38.4%	35.7%	11.5%	22.7%	0.0%	-	0.0%	40.0%	31.9%
	EA: Work Zone	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	0.0%	0.0%
	EA: Young Driver	21.8%	16.7%	0.0%	10.0%	13.3%	21.9%	14.3%	11.5%	4.5%	0.0%	22.2%	0.0%	-	17.7%

Fatal and Injury Crashes Occurring On Local System - SJTPO

Emphasis Area		Primary Emphasis Area													
		EA: Aggressive Driver	EA: Drowsy/ Distracted Driver	EA: Heavy Vehicle	EA: Impaired Driver	EA: Intersection	EA: Lane Departure	EA: Motorcycle	EA: Old Driver	EA: Pedestrian/ Bicyclist	EA: Train	EA: Unbelted Occupants	EA: Work Zone	EA: Young Driver	Total
Secondary Emphasis Area	EA: Aggressive Driver	-	35.1%	40.6%	37.9%	63.5%	37.1%	43.7%	50.0%	24.2%	100.0%	29.4%	47.8%	53.4%	45.3%
	EA: Drowsy/ Distracted Driver	43.2%	-	54.2%	72.1%	51.1%	54.0%	43.0%	57.7%	35.2%	100.0%	48.9%	65.7%	55.7%	55.8%
	EA: Heavy Vehicle	3.0%	3.2%	-	1.7%	3.2%	2.6%	0.7%	3.5%	2.9%	0.0%	1.5%	16.4%	1.9%	3.3%
	EA: Impaired Driver	5.9%	9.1%	3.7%	-	4.2%	14.3%	6.3%	2.2%	7.1%	0.0%	16.4%	7.5%	3.3%	7.1%
	EA: Intersection	53.2%	34.7%	37.3%	22.7%	-	18.4%	27.8%	48.2%	44.6%	0.0%	21.0%	32.8%	40.9%	38.0%
	EA: Lane Departure	27.3%	32.3%	26.6%	67.5%	16.2%	-	35.2%	21.2%	0.5%	0.0%	56.6%	14.9%	32.0%	33.4%
	EA: Motorcycle	3.2%	2.5%	0.7%	2.9%	2.4%	3.5%	-	2.1%	0.4%	0.0%	24.5%	3.0%	1.6%	3.3%
	EA: Old Driver	22.9%	21.4%	21.8%	6.5%	26.3%	13.2%	13.3%	-	15.5%	100.0%	5.0%	26.9%	13.5%	20.7%
	EA: Pedestrian/ Bicyclist	5.3%	6.3%	8.9%	10.0%	11.7%	0.1%	1.1%	7.5%	-	0.0%	22.4%	6.0%	3.9%	10.0%
	EA: Train	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.1%	0.0%	-	0.0%	0.0%	0.0%	0.0%
	EA: Unbelted Occupants	5.2%	7.0%	3.7%	18.6%	4.4%	13.6%	59.6%	1.9%	17.9%	0.0%	-	6.0%	4.3%	8.0%
	EA: Work Zone	0.9%	1.0%	4.1%	0.9%	0.7%	0.4%	0.7%	1.1%	0.5%	0.0%	0.6%	-	0.7%	0.8%
	EA: Young Driver	26.8%	22.7%	13.3%	10.7%	24.5%	21.8%	10.7%	14.8%	8.8%	0.0%	12.2%	19.4%	-	22.7%

All Crashes Occurring On Local System - SJTPO

Emphasis Area		Primary Emphasis Area													
		EA: Aggressive Driver	EA: Drowsy/ Distracted Driver	EA: Heavy Vehicle	EA: Impaired Driver	EA: Intersection	EA: Lane Departure	EA: Motorcycle	EA: Old Driver	EA: Pedestrian/ Bicyclist	EA: Train	EA: Unbelted Occupants	EA: Work Zone	EA: Young Driver	Total
Secondary Emphasis Area	EA: Aggressive Driver	-	25.4%	19.0%	29.7%	56.0%	21.4%	41.6%	37.9%	22.7%	50.0%	11.2%	31.5%	44.2%	32.6%
	EA: Drowsy/ Distracted Driver	41.0%	-	58.7%	74.3%	51.8%	52.0%	45.3%	58.8%	34.7%	50.0%	40.5%	66.1%	56.0%	52.7%
	EA: Heavy Vehicle	3.4%	6.5%	-	1.3%	4.4%	7.6%	1.4%	4.2%	2.4%	25.0%	4.6%	19.1%	2.5%	5.9%
	EA: Impaired Driver	4.1%	6.3%	1.0%	-	3.3%	8.5%	6.4%	1.3%	6.6%	0.0%	5.6%	5.0%	2.4%	4.4%
	EA: Intersection	45.6%	26.1%	20.0%	19.6%	-	12.6%	27.1%	34.9%	44.8%	0.0%	12.0%	25.5%	32.7%	26.6%
	EA: Lane Departure	24.8%	37.3%	48.8%	72.2%	18.0%	-	36.3%	22.5%	0.5%	0.0%	75.8%	31.5%	30.0%	37.8%
	EA: Motorcycle	1.4%	0.9%	0.3%	1.5%	1.1%	1.0%	-	0.7%	0.3%	0.0%	5.2%	0.7%	0.7%	1.1%
	EA: Old Driver	22.0%	21.1%	13.4%	5.4%	24.9%	11.2%	13.1%	-	15.1%	25.0%	3.9%	25.8%	11.9%	18.9%
	EA: Pedestrian/ Bicyclist	2.1%	2.0%	1.2%	4.5%	5.1%	0.0%	0.8%	2.4%	-	0.0%	5.2%	2.3%	1.4%	3.0%
	EA: Train	0.0%	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	-	0.0%	0.0%	0.0%	0.0%
	EA: Unbelted Occupants	4.0%	8.9%	9.0%	14.5%	5.2%	23.1%	56.4%	2.4%	20.0%	0.0%	-	8.7%	2.9%	11.6%
	EA: Work Zone	0.9%	1.1%	2.9%	1.0%	0.8%	0.7%	0.6%	1.2%	0.7%	0.0%	0.7%	-	0.6%	0.9%
	EA: Young Driver	25.8%	20.2%	8.2%	10.2%	23.5%	15.1%	12.0%	12.0%	8.8%	0.0%	4.9%	13.1%	-	19.0%

Attachment C

Horizontal Curve Risk Factor Analysis and Identification Memoranda and Risk Factor Scoring Tables

DVRPC Region, County and Municipal Routes

Horizontal Curve Risk Factor Analysis and Identification

PREPARED FOR: NJDOT
COPY TO: File
DATE: September 27, 2019
REVISION NO.: Original

1 Introduction

1.1 The Systemic Analysis Process

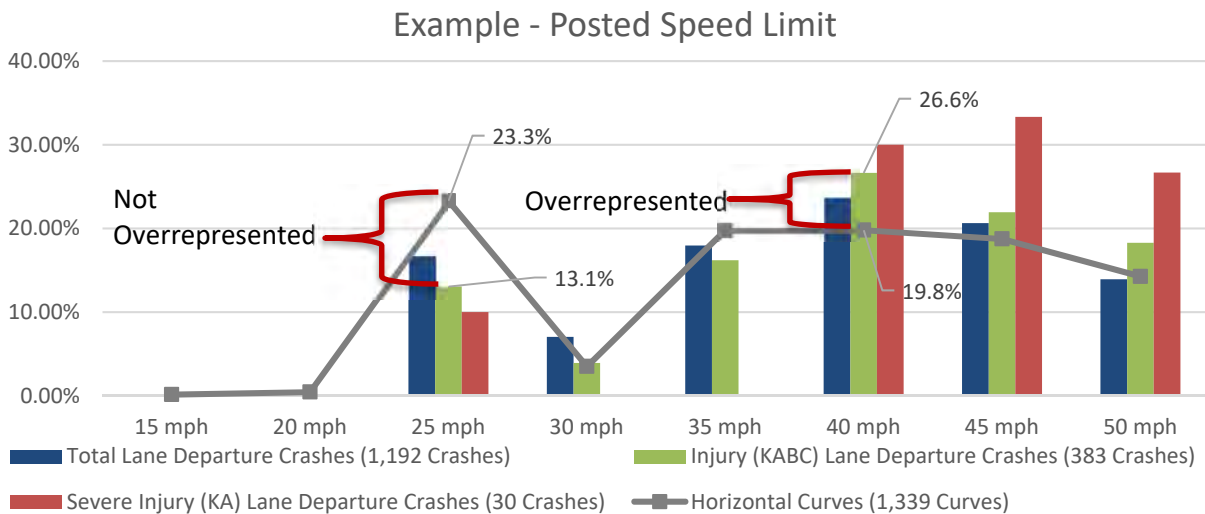
The systemic approach involves evaluating the crash history for focus crash types occurring across a roadway system. Risk factors are identified by documenting common roadway characteristics at sites where focus crashes have occurred. Once risk factors are identified, all sites with the system are scored for the number of risk factors present. All sites are prioritized based on risk score, with higher risk scores indicating locations where crashes are more likely to occur. Finally, countermeasures targeted at addressing the focus crash type are identified for the system, with implementation generally based on a combination of priority ranking and optimization of benefits considering budget and other factors. This memo focuses on the identification of risk factors for roadway/lane departure crashes occurring on horizontal curves on the County and Municipal Routes in the Delaware Valley Regional Planning Commission (DVRPC) jurisdiction. Subsequent steps including network screening, diagnosis and selection of countermeasure, and program development and implementation will be addressed in later documents.

The location and geometry of the horizontal curves on the DVRPC's local system was identified from data collected through the Curve Advisory Reporting Service (CARS), the NJDOT Straight Line Diagrams (SLD) database, and through additional manual data collection. Potential risk factors at horizontal curves on County and Municipal routes in the DVRPC region were identified by comparing the proportion of injury crashes associated with a specific roadway feature to the proportions of curves with this feature. Injury crashes include K, A, B, and C severity crashes based on the National Safety Council's KABCO scale as defined in the following table:

Crash Severity Code	Highest Injury Sustained in Crash
K	Killed
A	Incapacitating Injury
B	Non-incapacitating Injury
C	Possible Injury
O	No Injury (Property Damage Only)

Source: <https://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/sec4.cfm>

Roadway feature data, collected and documented in other tasks, describe the infrastructure and operation for each curve. The presence, or absence, of a roadway feature was classified as a risk factor when the proportion of total injury crashes related to a specific feature exceeded the proportion of curves. The degree of overrepresentation was defined as the difference between the portion of fatal and injury crashes compared to the proportion of curve inventory. Consider the following figure as an example.



Charts like this one help to initially visualize overrepresentation of risk factors across the analysis network. In the above chart, the green vertical bars represent the proportion of fatal and injury crashes occurring on curves with specific posted speed limits along the x-axis. The solid grey line represents the proportion of curves within each speed limit group.

When the green bar is above the grey line a roadway feature is considered overrepresented. When the green bar is below the grey line a feature is not considered overrepresented. The degree of overrepresentation is determined as the difference between the green bar (proportion of fatal and injury crashes) and the grey line for proportion of curves. In the above example, curves with a posted speed limit of 40 MPH represent 19.8% of injury crashes and 26.6% of the regional curve inventory. This means the number of injury crashes at the curves in suburban areas are higher than would be expected considering the proportion of total curves (as compared to the rest of the system) that are in suburban areas. The attribute 'Posted Speed Limit of 40 MPH' is overrepresented by 6.8% (the difference between the percent of injury crashes and the curve inventory line). Similarly, curves with posted speed limits of 45 MPH and 50 MPH are also overrepresented, though to a lesser degree (3.2% and 4.0%, respectively). These factors may be combined into a single recommended risk factor, 'Posted Speed Limit of 40 MPH and Greater'. Further, curves with posted speed limits less than 40 MPH are not overrepresented.

For the analysis documented within this memo, the study curves are the curves within the DVRPC region occurring on County and Municipal routes as identified by the CARS analysis. The referenced crashes are the lane departure crashes occurring on the identified study curves. Each curve in this regional network will be assigned a risk score based on the number of primary and secondary risk factors (as defined in this memo) present at the curve. One point will be added to the risk score for each primary risk factor present along the curve and one-half point for each secondary risk factor. Separate analyses were conducted for the DVRPC and South Jersey Transportation Planning Organization (SJTP) regions to ensure appropriate risk factors are identified for each region. While both analyses are presented in uniform memos, not all figures or recommendations will match between the two regions. Certain attributes require different groupings/bin sizes to determine any overrepresentation within the region.

1.2 Risk Factors

Roadway features are determined to be risk factors based on the degree of overrepresentation of the crashes associated with that feature across the network based on the following criteria:

- Primary risk factors exhibit overrepresentation of 5% or more across the analysis network.
- Secondary risk factors exhibit overrepresentation greater than or equal to 1% but less than 5% across the analysis network.
- Potential risk factors that were analyzed but found to exhibit overrepresentation of less than 1% are not recommended as risk factors.

Continuing with the previous example, the overrepresentation of fatal and injury crashes on curves with posted speed limits of 40 MPH and greater are overrepresented by a combined 14.0%, which makes it a primary risk factor.

An important benefit of the systemic analysis is that while an individual site may not show an overrepresentation for a specific factor, if the risk factor is present at the site it will still be scored; the presence of the risk factor indicates there is a greater potential for a crash to occur compared to sites without the risk factor present. This method of analyzing risk for fatal and injury crashes uses the presence of risk factors to rank and prioritize locations, irrespective of whether a crash has occurred at the site. This is particularly important for rural and lower classification routes where volumes and associated crash frequency are relatively low.

Roadway/lane departure crash data was collected for 1,339 identified curves within the DVRPC region for the period of 2014-2016. Crash data was obtained from two sources:

- New Jersey Department of Transportation (NJDOT) Bureau of Transportation Data and Safety (BTDS). *2012-2016 Raw Crash Data and Master File Layout*. Accessed 10 April 2018. <http://www.gpiprojects.com/HSIP>
- NJDOT BTDS. *Safety Voyager Geodatabase 2012-2016*. Personal Communication [fileshare.gpinet.com] with CH2M HILL. 19 April 2018.

A total of 1,192 crashes (383 fatal and injury and 809 property damage only) were identified from this data set as having occurred within the limits of the 351 curves.

The following table contains a summary of the recommended primary and secondary risk factors.

<i>Primary Risk Factors – 1 point</i> <i>(full risk point weighting)</i>
Absence of guide rail with edge risk rating of 2C
Adjacent intersection present (internal or within 50 feet of the curve)
Area Type - suburban
Curve length between 500 feet and 800 feet
Functional Classification(s) - Other Principal Arterials and Minor Arterial
Posted speed limit - 40 MPH and greater
Superelevation of 6% to 8%
Presence of fatal or severe injury crash

<i>Secondary Risk Factors – ½ point (half-point risk weighting)</i>
Curve radius - between 200 and 500 feet
Number of lanes – four
Visual trap

Factors assessed for safety but determined not to be risk factors include:

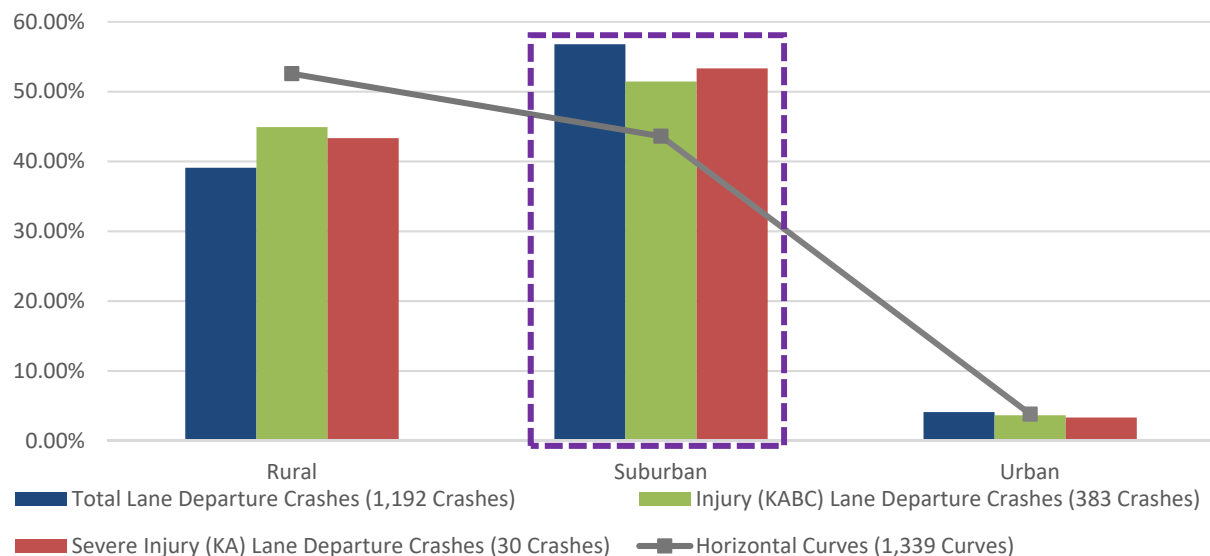
- Turn lane
- Highway lighting
- Lane width
- Sidewalk
- Shoulder type
- Shoulder width
- Horizontal curve warning signs
- Highway division
- Curve delineation (including raised pavement markers, chevrons, and reflective delineators)

Additional analysis for each recommended risk factor is presented in Sections 2 and 3 of this document. Section 4 of this document contains additional analysis of each factor analyzed but not recommended as a risk factor.

2 Primary Risk Factors

The following seven roadway factors were identified as primary risk factors through an evaluation of overrepresentation of injury crashes. In the following charts, a roadway feature is considered overrepresented when the green bar is above the grey line. When the green bar is below the grey line a factor is not considered overrepresented. The degree of overrepresentation is determined as the difference between the green bar (proportion of injury crashes) and the grey line (proportion of curves). Primary risk factors are those where the degree of overrepresentation is 5% or greater. The following primary risk factors are presented in alphabetical order. There is no recommended prioritization of these factors based on degree of overrepresentation or other considerations.

2.1 Area Type

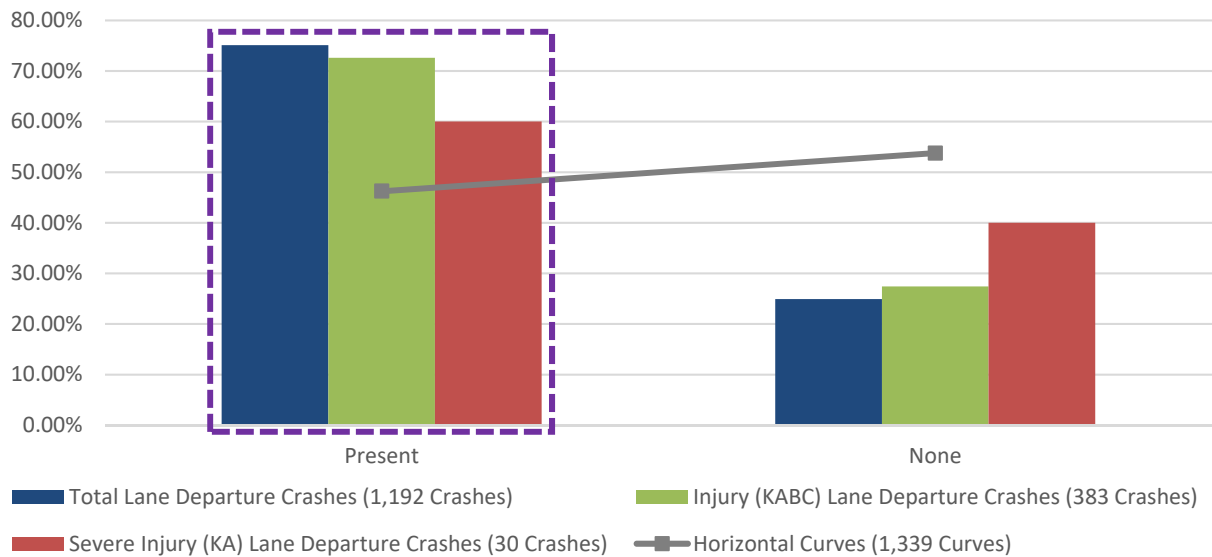


Area type is classified based on the ITE Context Zone Definitions (<https://www.ite.org/pub/?id=e1cfb244-2354-d714-517d-2004292b5f99>) where:

- “Rural” indicates a natural landscape or agricultural activity and natural features (ITE zones C-1 and C-2).
- “Suburban” indicates detached buildings with landscaped yards (ITE zone C-3).
- “Urban” indicates everything from predominantly detached buildings with a balance between landscape and buildings with pedestrians present, to attached buildings forming a sense of enclosure and continuous street wall landscaping within the public right of way with high pedestrian and transit activity (ITE zones C-4, C-5, and C-6).

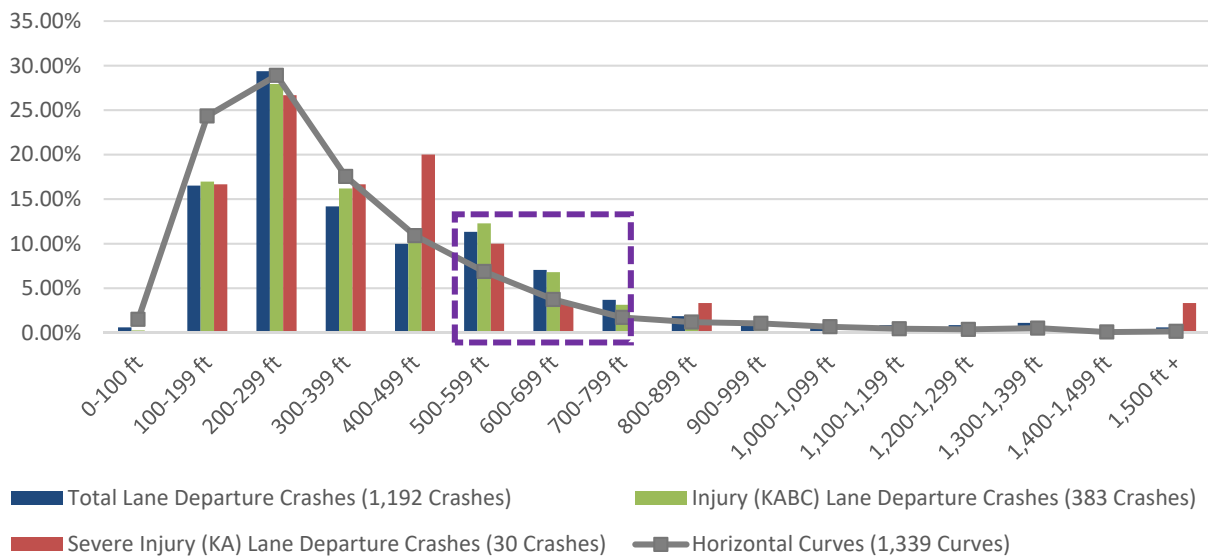
Suburban area types are overrepresented by 7.8%, as shown in the above figure. **As such, suburban area type is recommended as a primary risk factor.**

2.2 Adjacent Intersection



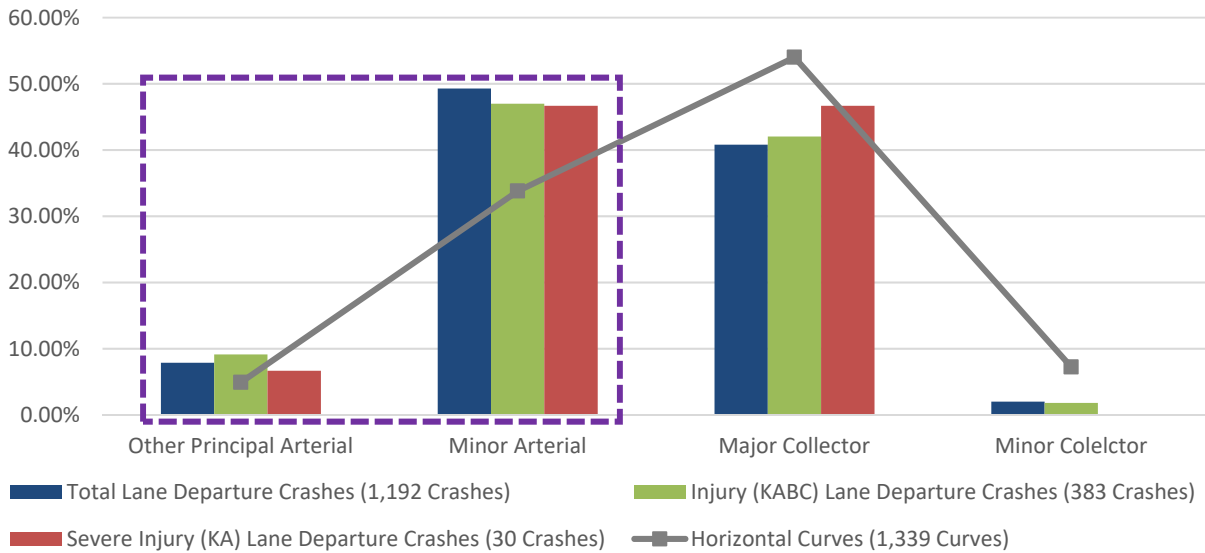
Adjacent intersection pertains to any curve with an intersecting roadway anywhere along or within 50 feet of the beginning or end points of the curve. Curves with adjacent intersections are overrepresented by 26.4%, as shown in the above figure. **Adjacent intersections (internal or within 50 feet of the curve) are recommended as a primary risk factor.**

2.3 Curve Length



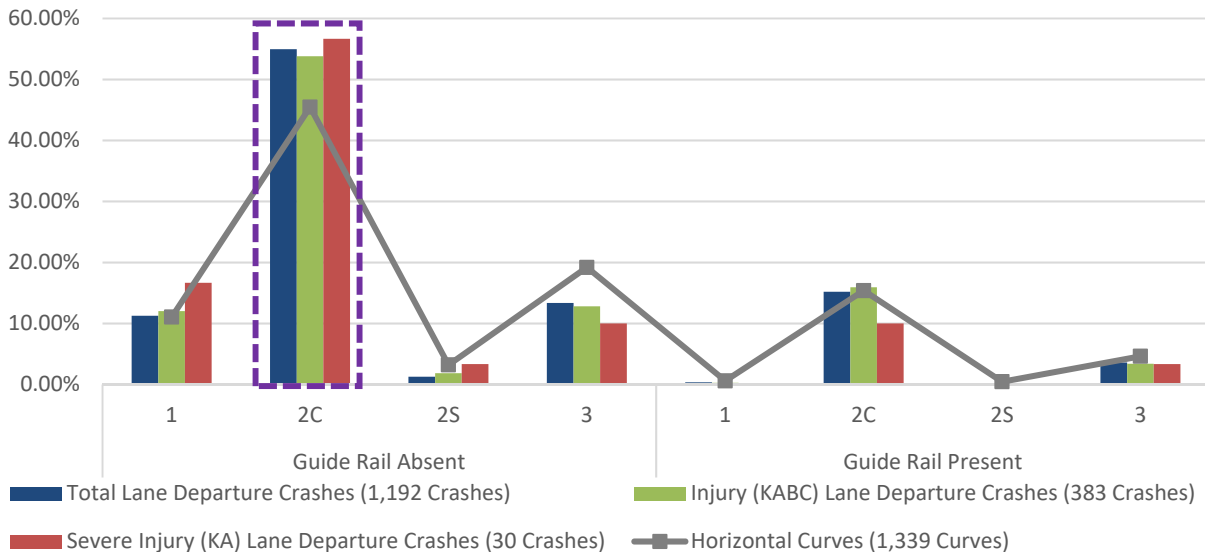
The length of the curve (as measured from PC to PT) is a geometric property of curves as measured in the field. Curves with a length between 500 feet and 800 feet account for 12.3% of study curves and 22.2% of fatal and injury crashes, an overrepresentation of 9.9%. **Curves with a length greater than or equal to 500 feet and less than 800 feet are recommended as a primary risk factor.**

2.4 Functional Classification



Functional classifications found on curves within the region ranged between Other Principal Arterials to Minor Collectors. Roads with a classification of 'Local' were not included in the investigation. Other Principal Arterial and Minor Arterial classified curves are overrepresented by a combined 18.5%. **Functional classifications of Other Principal Arterial and Minor Arterial are recommended as a primary risk factor.**

2.5 Guide Rail and Edge Risk Rating



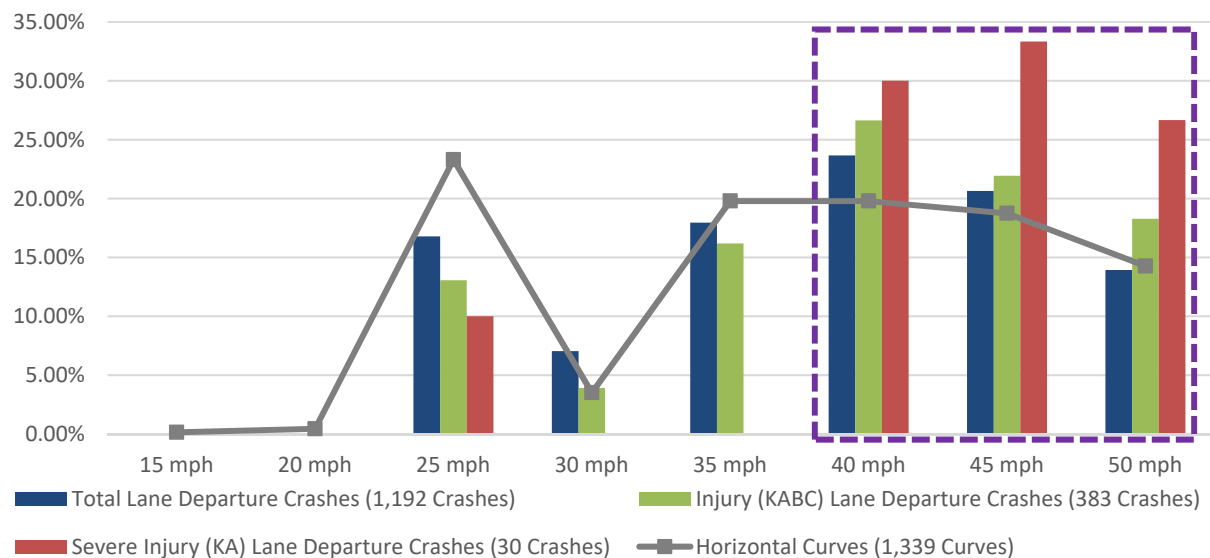
Guide rail installations are roadside barriers which reduce the severity of crashes when vehicles leave the roadway. Guide rail is intended to prevent a vehicle from striking fixed objects along the roadside or entering an otherwise unrecoverable roadside condition. The absence of guide rail was found to be 2.0% overrepresented on its own. This is a valid result given that guide rail is

intended to reduce severity of crashes and keep vehicles from striking more dangerous roadside objects when there are issues with the clear zone outside of the curve. The relationship with the absence of guide rail was further tested to determine if the overrepresentation and potential risk trend was enhanced through a combination evaluation with edge risk rating. Edge risk rating refers to the condition beyond the traveled way in terms of vehicle recovery once a vehicle leaves the travel lane. Edge risk ratings are specifically defined as:

- 1 – Usable shoulder, reasonable clear zone
- 2S – No usable shoulder, reasonable clear zone
- 2C – Usable shoulder, roadside with fixed objects
- 3 – No usable shoulder, roadside with fixed objects

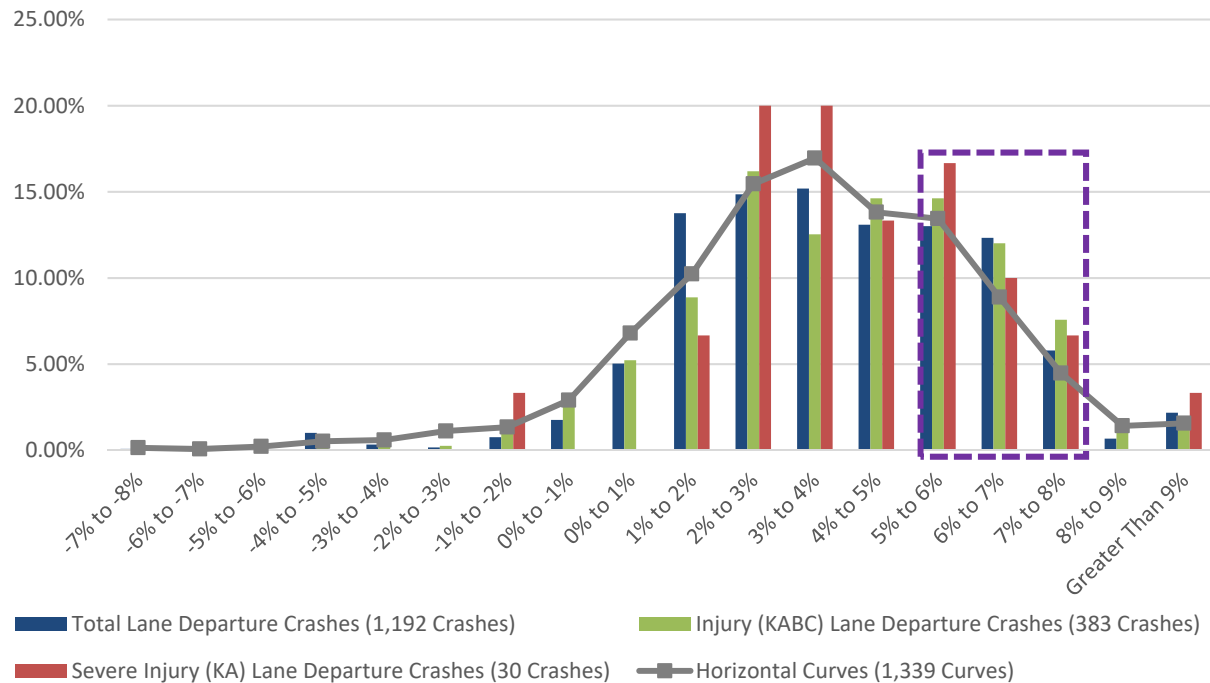
These two conditions are highly related in terms of traffic safety. Guide rail is typically installed only where the roadside is inadequate for a vehicle to recover, conditions captured by edge risk ratings 2C and 3. Evaluation of guide rail and edge risk rating together shows that the only significant overrepresentation occurs when guide rail is not present, and the edge risk rating is 2C (sufficient shoulder without reasonable clear zone). **Absence of guide rail with an edge risk of 2C is recommended as a primary risk factor.**

2.6 Posted Speed Limit



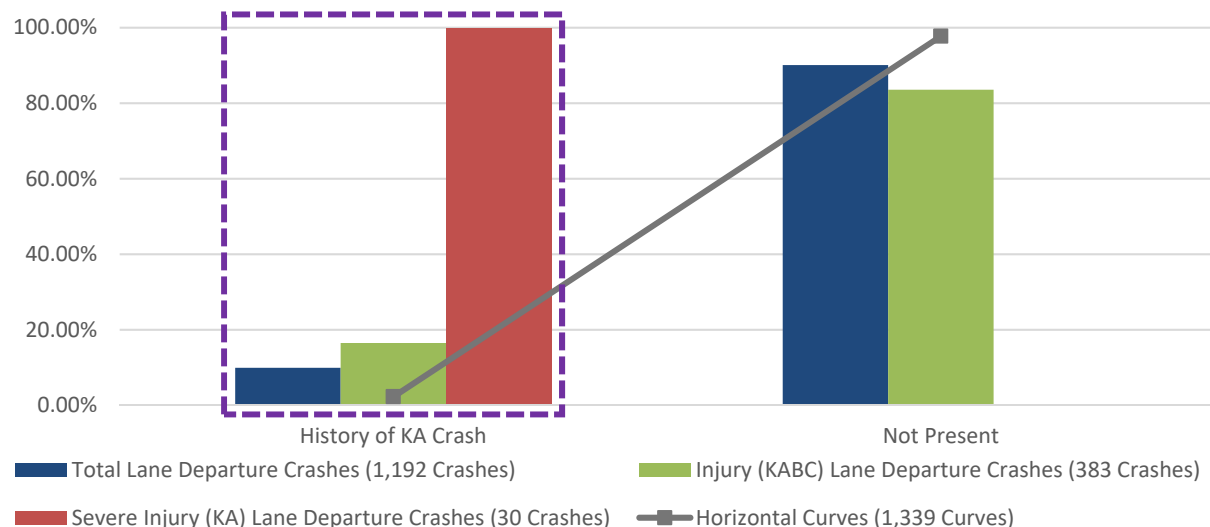
Posted speed limit refers to the posted speed limit of the roadway that the curve lies along; this is not an advisory or warning speed. Curves with posted speed limits of 40 MPH exhibit an overrepresentation of 14%, as shown in the above figure. **Posted speed limits of 40 MPH and greater are recommended as a primary risk factor.**

2.7 Superelevation



Superelevation is the amount the outer edge of a curve is banked above the inner edge of the curve. Superelevation between 5 and 8 percent exhibit a combined overrepresentation of 7.4%. Due to this overrepresentation, **superelevation greater than or equal to 5 percent and less than 8 percent is recommended as a primary risk factor.**

2.8 Presence of a Fatal or Severe Injury (KA) Crash

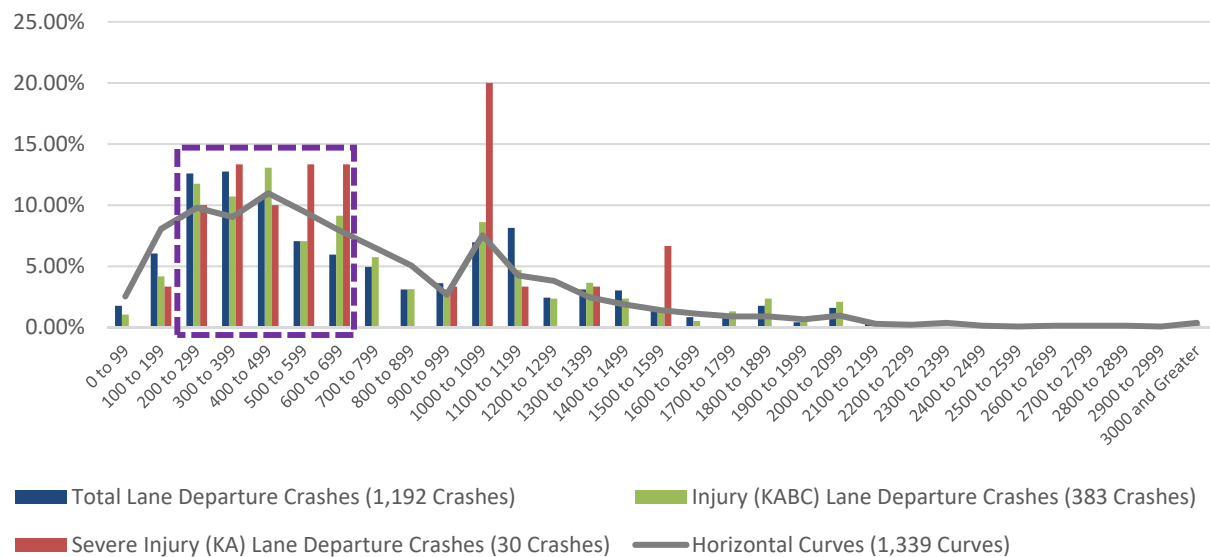


Curves with at least one fatal or severe injury (K or A) crash during the study period are overrepresented for injury lane departure crashes by 14.2% and are recommended as a primary risk factor. This risk factor will help to prioritize lane departure KA crashes within the region.

3 Secondary Risk Factors

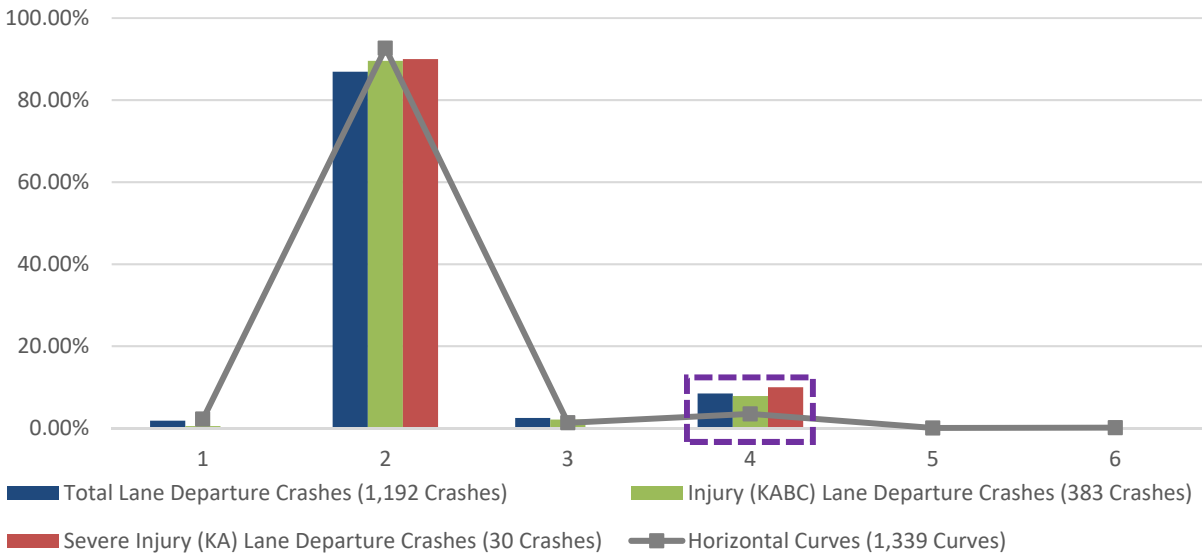
The following three roadway factors were identified as secondary risk factors through an evaluation of overrepresentation of injury crashes. In the following charts, a roadway feature is considered overrepresented when the green bar is above the grey line. When the green bar is below the grey line a factor is not considered overrepresented. The degree of overrepresentation is determined as the difference between the green bar (proportion of injury crashes) and the grey line (proportion of curves). Secondary risk factors exhibit overrepresentation greater than or equal to 1% but less than 5% across the analysis network. The following secondary risk factors are presented in alphabetical order. There is no recommended prioritization of these factors based on degree of overrepresentation or other considerations.

3.1 Curve Radius



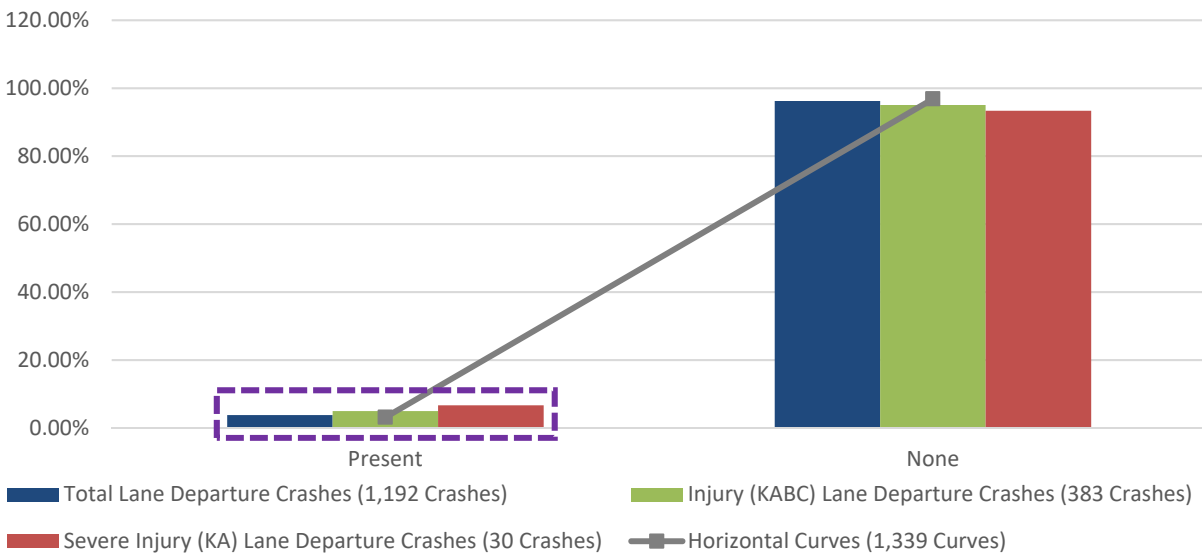
Curve radius is a geometric design property of curves, which is measured to the center of the inside most traveled lane. Curves with a radius between 200 feet and 700 feet are overrepresented by a combined 4.5%. **Curve radius greater than 200 feet and less than 700 feet is recommended as a secondary risk factor.**

3.2 Number of Lanes



Number of lanes refers to the number of through travel lanes present along the entirety of a curve. The count does not include turn lanes. As shown above curves with four lanes are overrepresented by 3.3%. As such, **total through lane count equal to four is recommended as a secondary risk factor.**

3.3 Visual Trap



A visual trap is a minor road, tree line, powerline, or other feature located along the tangent of a curve which may make the road appear to continue straight instead of following the curve. An example of a visual trap is shown in the figures below.

Within the region, a visual trap presence was overrepresented by 1.9%. **As such, visual trap is recommended as a secondary risk factor.**



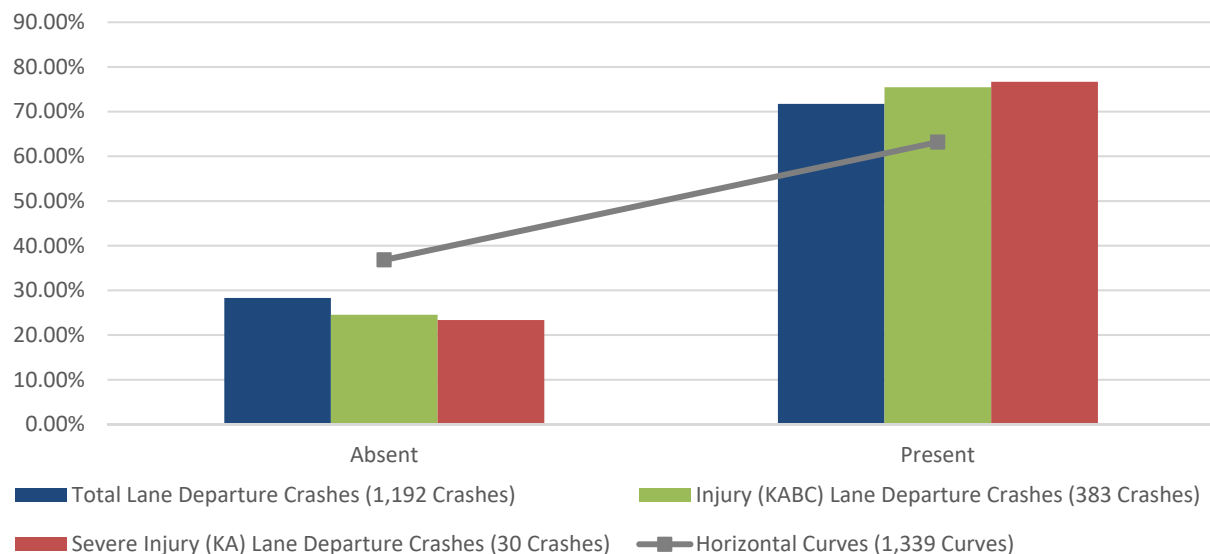
4 Features Not Recommended as Risk Factors

The following factors were considered but are not recommended as primary or secondary risk factors. There are three primary reasons for potential factors to be excluded as risk factors:

1. There is no apparent overrepresentation relating the factor to increased risk of a lane departure crash at curves.
2. The overrepresentation exhibited by the factor is directly related to the overrepresentation exhibited by another factor. If two factors highlight the same risk pattern, only one factor should be considered to avoid duplicating the risk those factors represent.
3. There is mild overrepresentation for a factor, however the factor does not logically relate to an increase risk for a crash, i.e. the presence of sidewalks in the region is mildly overrepresented (1.3%), however the presence of sidewalks does not lead to a logical connection with or potential project for lane departure crashes at curves. This distinction is based on engineering judgement.

The following factors are presented in alphabetical order. Additional information is provided for each factor as to why it is not recommended as a primary or secondary risk factor.

4.1 Curve Delineation (RPMs, Chevrons, Retroreflective Delineators)

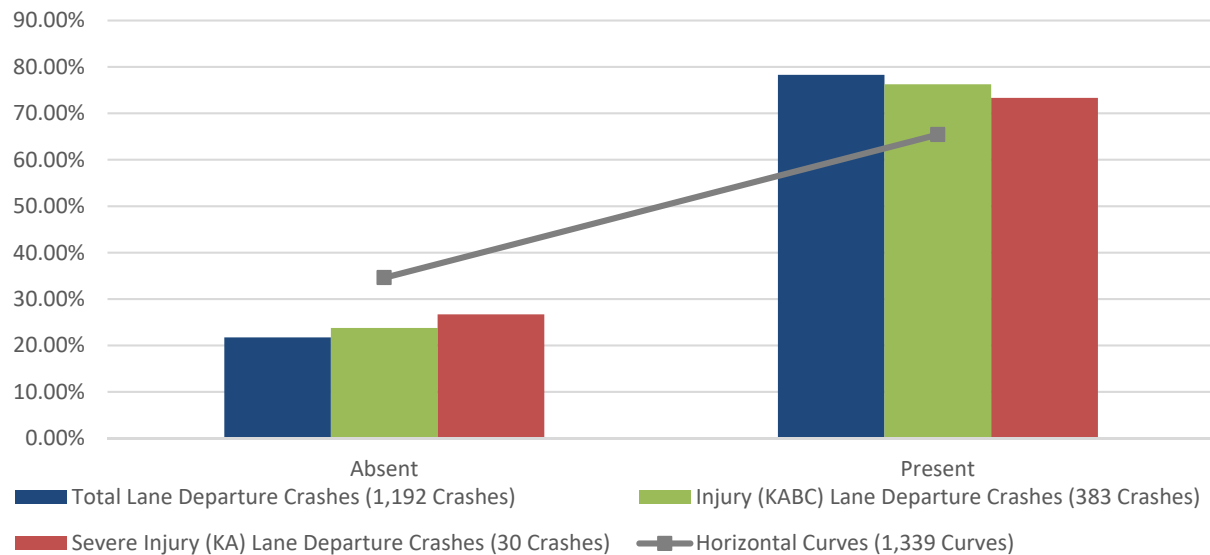


Delineators, including raised pavement markers, chevron signs, arrow boards, and retroreflective delineators are installations meant to serve as visual guides and to assist drivers in navigating curves. Among study curves, 36.8% had no delineation present. These curves are not overrepresented within the region. Conversely, it is worth noting that curve warning signs and delineation measures are typically a countermeasure used to reduce crash frequency at curve locations.

It is likely that the warning signs or delineators may have been installed at locations that were or are consistently experiencing a high frequency of crashes or have been proactively installed given they are a proven safety countermeasure known to reduce and prevent crashes on curves.

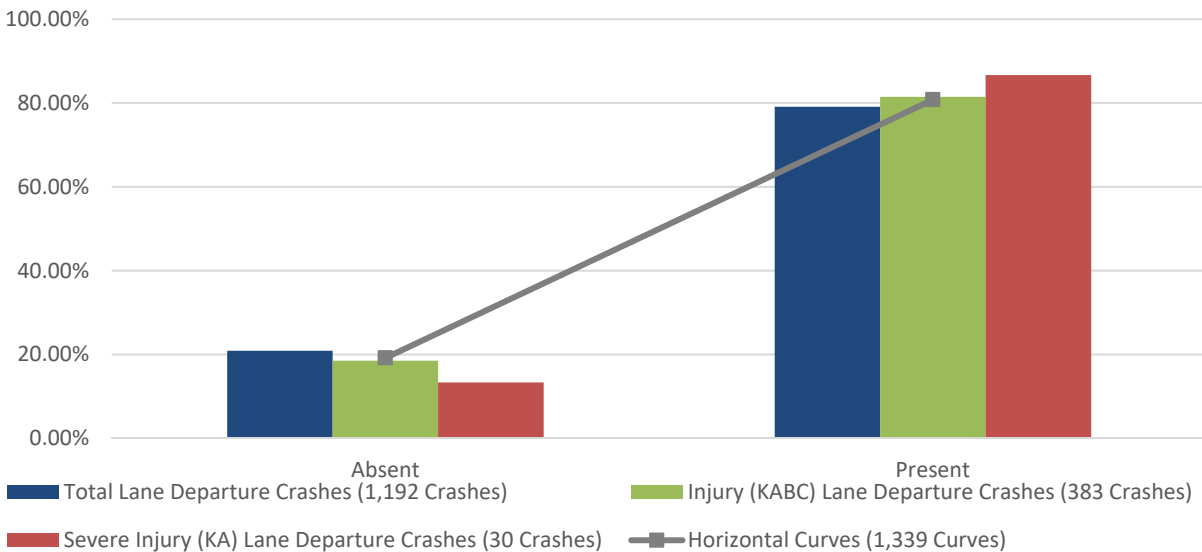
Due to the purpose for which the warning signs and delineators have likely been installed, the presence of either should not be considered as a risk factor and should not be evaluated for overrepresentation.

4.2 Highway Lighting



Highway lighting helps drivers navigate curves, identify other vehicles, and alert drivers to unexpected roadway features such as intersections in curves. Unlit curves are not overrepresented with the region, as shown in the above figure. Furthermore, highway lighting may have been installed as a countermeasure at locations experiencing a high frequency of crashes. **Absence of highway lighting (unlit curves) are not overrepresented and therefore are not recommended as a primary or secondary risk factor.**

4.3 Horizontal Curve Warning Sign

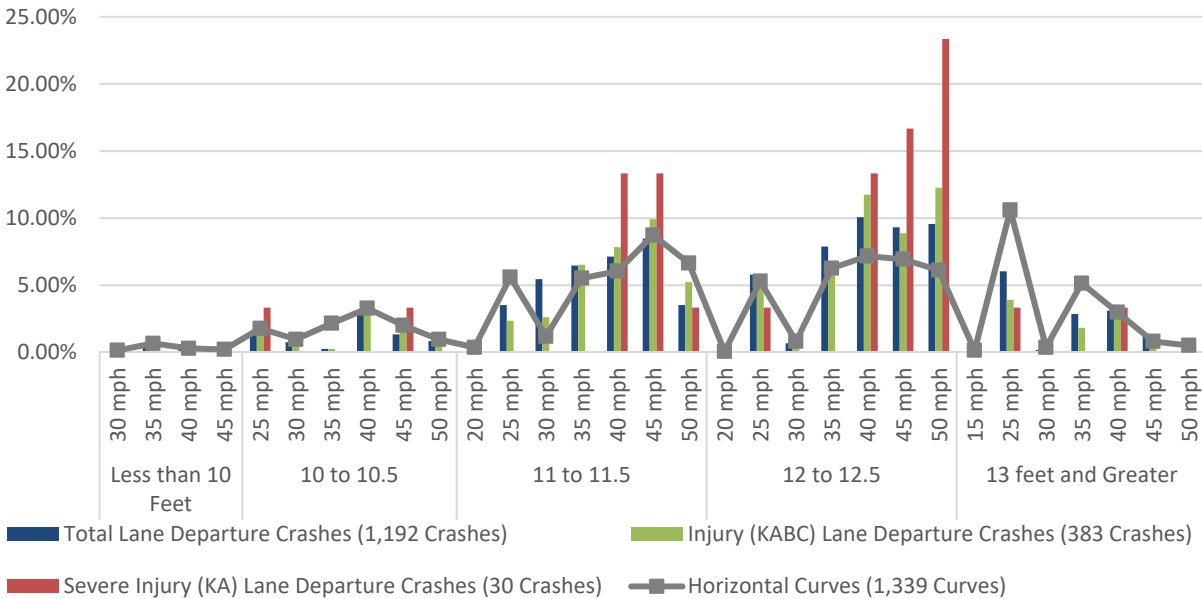


Approximately 19.2% of curves did not have curve warning signs. These curves showed no overrepresentation for lane departure crashes, indicating that the absence of horizontal curve warning signs should not be a risk factor. Conversely, it is worth noting that curves with warning signs are overrepresented based on proportion of curve inventory. However, curve warning signs are typically a countermeasure used to reduce crash frequency at curve locations.

It is likely that the warning signs were installed at locations that were or are consistently experiencing a high frequency of crashes or have been proactively given they are a proven safety countermeasure known to reduce and prevent crashes on curves.

Due to the purpose for which the warning signs have likely been installed, the presence of curve warning signs should not be considered as a risk factor. However, installing appropriate curve warning signs, as directed by the Manual for Uniform Traffic Control Devices, should be considered as one potential step to reduce the frequency of lane departure crashes in the next steps of this project.

4.4 Lane Width



Curves with 12 to 12.5-foot lanes initially showed significant overrepresentation, when considered alone. However, 12-foot lanes are generally accepted as the base condition for safety. The perceived overrepresentation of the safer condition warrants further investigation to try to explain if there are additional factors or a combination of factors that better represent risk across the network. Several combinations of risk factors were developed to better understand the risk associated with 12-foot wide lanes including the following:

- Area type
- Curve radius
- Functional classification
- Guide rail presence
- Shoulder width
- Median presence
- Posted speed limit

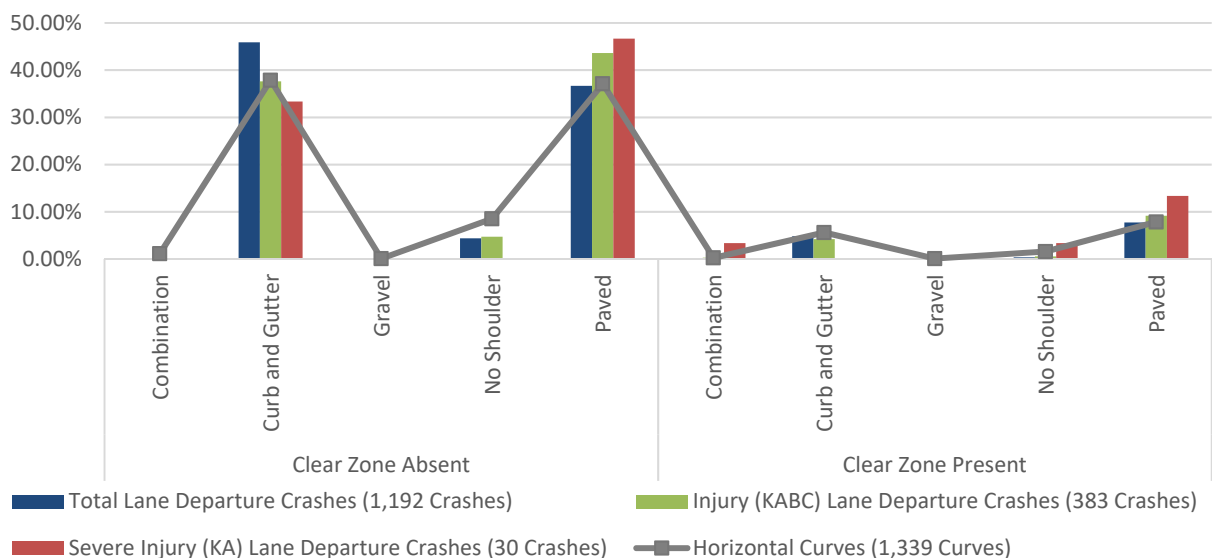
The combination with posted speed limit showed that the 12 and 12.5-foot lanes are only overrepresented where the posted speed is equal to or greater than 40 MPH. This range has already been noted as a primary risk factor. Also, the figure above shows that the posted speed limit risk factor is also present in other lane widths. **As such, lane width nor any combination risk factor with lane width is not recommended as a primary or secondary risk factor.**

4.5 Median Presence



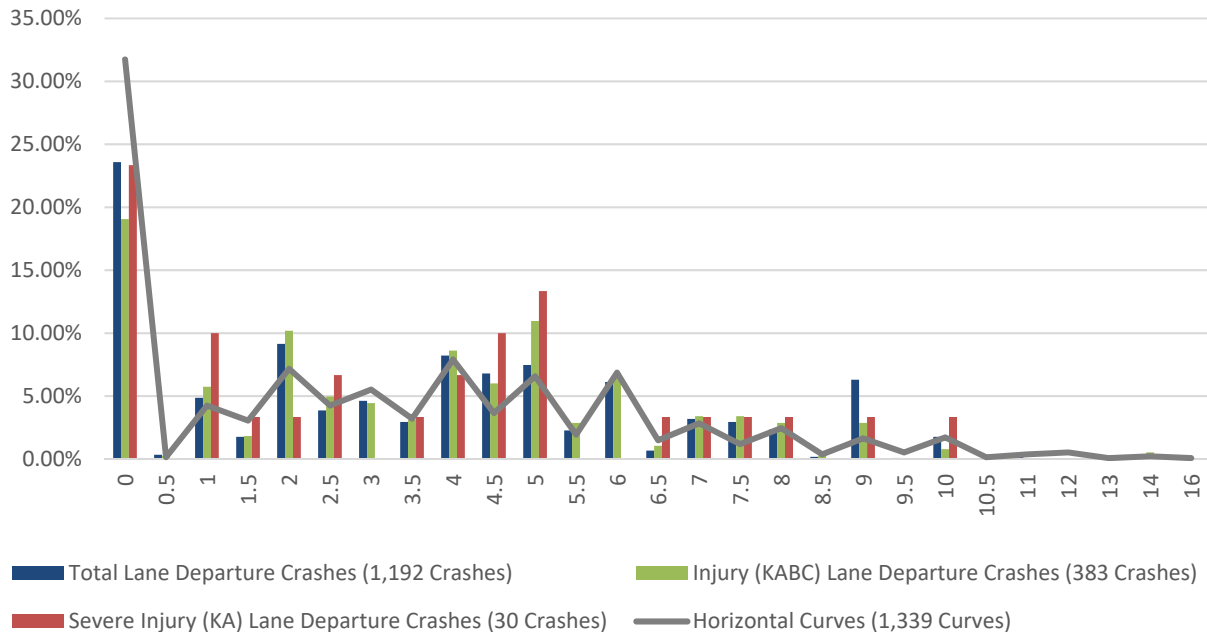
Curves with a median (including grass, raised pavement, or painted but excluding two-way left-turn lanes) accounted for 8.0% of study curves and 8.9% of injury crashes. **These curves are not overrepresented and therefore, median presence or absence is not recommended as a primary or secondary risk factor.**

4.6 Shoulder Type

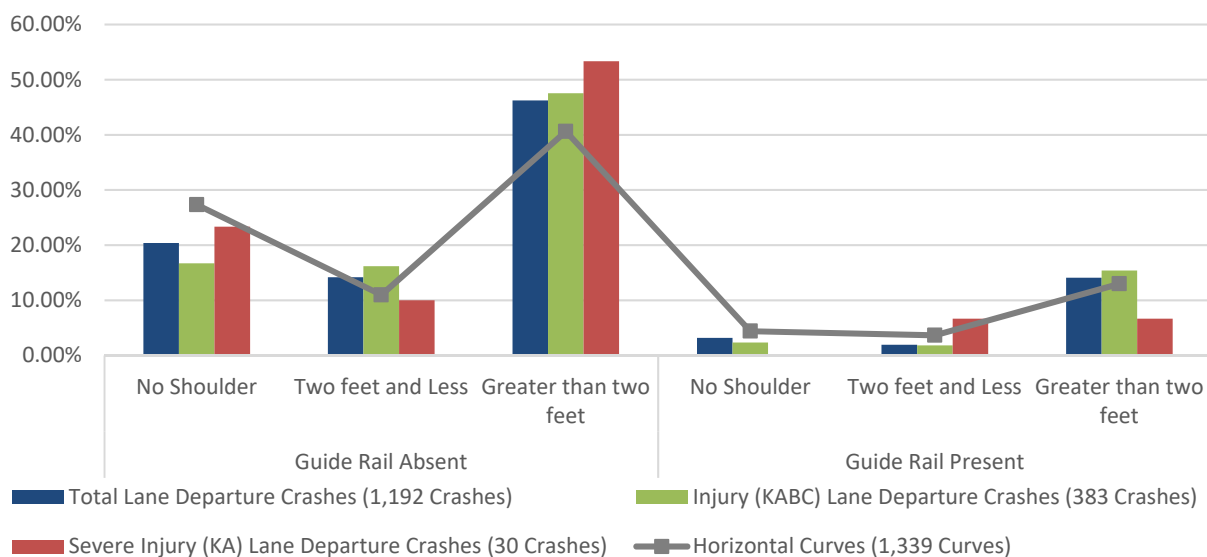


Shoulder type refers to the material immediately adjacent to the traveled way. Well-designed shoulders allow vehicles to safely return to the traveled way after a roadway departure. The initial assessment of shoulder type indicated that paved shoulder appeared overrepresented, however, when a combination of factors is used to analyze shoulder type with quality of clear zone (based on edge risk rating of 2C or 3), the overrepresentation for paved shoulder is only apparent where the clear zone is not adequate. This indicates that adequate clear zone is the more significant risk factor. Clear zone is captured in the risk factor for absence of guide rail with an edge risk rating of 2C. **Shoulder type is not recommended as a primary or secondary risk factor.**

4.7 Shoulder Width

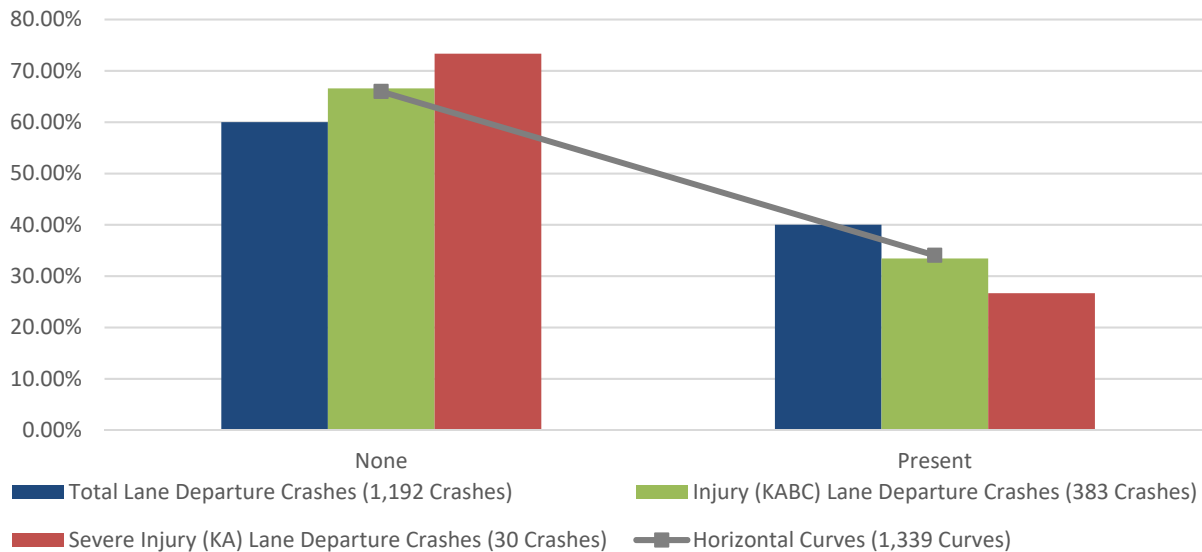


The initial investigation of shoulder width shows potential overrepresentation at widths of 1 foot, 2 feet, 4-5 feet, 7-8 feet and 9 feet. These scattered widths generally represent all shoulder widths, which is not logical. Enhanced shoulders allow vehicle an opportunity return safely to the traveled way.



Further investigations show that shoulder widths overrepresentation is related to presence of guide rail. As guide rail and inadequate clear zone are already recommended as a risk factor, **shoulder width is not recommended as a primary or secondary risk factor.**

4.8 Sidewalk



Curves with presence of a sidewalk represent 34.1% of study curves and account for 33.4% of injury crashes. **Sidewalk presence or absence are not overrepresented and are therefore not recommended as a primary or secondary risk factor.**

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor				Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present	Total Lane Departure (KABCO)		Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)	
00000544__	14.93	Burlington	☆	☆	☆	☆	☆	☆	☆		☆			7.5	6	0	0	
00000541__	16.9	Burlington	☆	☆	☆		☆	☆		☆		☆		6.5	6	2	1	
00000545__	8.86	Burlington	☆	☆	☆	☆		☆	☆		☆			6.5	9	6	0	
08000651__	4.37	Gloucester		☆	☆	☆	☆	☆		☆	☆			6.5	20	8	1	
08000663__	2.26	Gloucester	☆	☆	☆	☆	☆	☆			☆			6.5	0	0	0	
04000689__	6.59	Camden	☆	☆	☆	☆	☆	☆			☆	☆		6	1	0	0	
00000569__	6.64	Mercer	☆			☆	☆	☆	☆					6	10	2	0	
03000630__	3.59	Burlington	☆	☆	☆	☆	☆	☆			☆	☆		6	9	5	0	
03000630__	3.77	Burlington		☆	☆	☆	☆	☆			☆	☆		6	7	0	0	
03000644__	6.68	Burlington	☆	☆	☆	☆	☆	☆			☆		☆	6	0	0	0	
03000673__	0	Burlington		☆	☆	☆	☆	☆	☆		☆	☆		6	0	0	0	
08000619__	3.34	Gloucester	☆	☆	☆	☆	☆	☆						6	3	3	0	
08000676__	0.03	Gloucester		☆	☆	☆	☆	☆	☆		☆	☆		6	0	0	0	
11000620__	1.96	Mercer		☆	☆		☆	☆			☆	☆		6	4	1	0	
11031976__	1.98	Mercer	☆			☆	☆	☆						6	0	0	0	
00000524__	0.57	Mercer		☆	☆	☆	☆	☆			☆			5.5	0	0	0	
00000524__	0.78	Mercer	☆	☆	☆	☆	☆	☆			☆			5.5	0	0	0	
00000526__	5.14	Mercer		☆	☆	☆	☆	☆	☆		☆			5.5	12	0	0	
00000534__	3.52	Camden		☆	☆		☆	☆		☆	☆			5.5	2	1	1	
00000535__	6.04	Mercer			☆	☆	☆	☆		☆		☆		5.5	2	2	1	
00000541_A102100	0.01	Burlington		☆	☆		☆	☆	☆		☆			5.5	0	0	0	
00000542__	8.66	Burlington	☆	☆		☆		☆	☆		☆			5.5	0	0	0	
00000543__	22.43	Burlington	☆	☆	☆	☆		☆			☆			5.5	2	0	0	
00000545__	8.58	Burlington		☆	☆	☆	☆	☆			☆			5.5	1	0	0	
00000561__	39.34	Camden			☆	☆	☆	☆	☆			☆		5.5	0	0	0	
00000561__	39.77	Camden	☆	☆	☆		☆	☆				☆		5.5	0	0	0	
00000571__	38.57	Mercer	☆		☆		☆	☆	☆			☆		5.5	0	0	0	
00000571__	38.93	Mercer			☆	☆	☆	☆	☆			☆		5.5	9	5	0	
00000579__	4.28	Mercer		☆	☆		☆	☆	☆		☆			5.5	5	1	0	
00000579__	4.36	Mercer	☆		☆	☆	☆	☆	☆		☆			5.5	1	1	0	
00000579__	4.5	Mercer	☆	☆	☆	☆	☆	☆			☆			5.5	0	0	0	
00000579__	4.52	Mercer	☆	☆	☆	☆	☆	☆			☆			5.5	7	1	0	
03000603__	5.94	Burlington		☆	☆		☆	☆		☆	☆			5.5	1	1	1	
03000607__	1.79	Burlington		☆	☆	☆	☆	☆				☆		5.5	0	0	0	
03000618__	2.69	Burlington		☆	☆	☆	☆	☆		☆	☆			5.5	3	2	1	
03000626_X100420	0.03	Burlington		☆	☆	☆	☆	☆			☆			5.5	0	0	0	
03000630__	6.34	Burlington	☆		☆	☆	☆	☆	☆		☆			5.5	1	1	0	
03000630__	9.29	Burlington	☆	☆	☆	☆	☆	☆			☆			5.5	0	0	0	
03000656__	1.1	Burlington	☆		☆		☆	☆	☆		☆			5.5	1	0	0	
03381411__	0.47	Burlington		☆	☆		☆	☆		☆	☆			5.5	2	2	1	
04000705__	0.14	Camden	☆	☆			☆	☆	☆		☆			5.5	3	2	0	
08000610__	4.52	Gloucester	☆	☆	☆		☆	☆			☆			5.5	4	2	0	
08000658__	0.03	Gloucester	☆	☆	☆		☆	☆	☆		☆			5.5	5	2	0	
08000651__	2.17	Gloucester	☆		☆	☆	☆	☆			☆			5.5	1	0	0	
08000655__	0.01	Gloucester	☆	☆	☆		☆	☆						5.5	0	0	0	
08111036__	3.01	Gloucester		☆	☆		☆	☆		☆	☆			5.5	2	1	1	

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve		Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)			
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes		Visual Trap Present	Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
11000634__	3.94	Mercer		☆	☆	☆	☆	☆				☆			3	0	0
11000636__	2.79	Mercer	☆	☆	☆	☆	☆				☆				4	1	0
11000638__	3.44	Mercer		☆	☆	☆	☆	☆				☆			5	1	0
11011070__	0.39	Mercer	☆			☆	☆		☆						0	0	0
11051089__	2.67	Mercer			☆			☆	☆	☆					4	2	1
00000526__	7.29	Mercer		☆		☆	☆	☆			☆		☆		0	0	0
00000530__	10.6	Burlington		☆	☆	☆	☆	☆							10	6	0
00000530__	12.04	Burlington	☆			☆	☆	☆	☆						5	2	0
00000533__	0.05	Mercer		☆	☆	☆	☆	☆				☆			5	1	0
00000537__	3.39	Camden	☆	☆			☆		☆						1	0	0
00000543__	4.54	Camden		☆	☆	☆	☆	☆							2	1	0
00000543__	4.97	Camden		☆	☆	☆	☆	☆							0	0	0
00000553A__	3.09	Gloucester	☆			☆	☆	☆							5	0	0
00000555__	28.91	Gloucester			☆	☆	☆	☆	☆						5	1	0
00000563__	29.29	Burlington	☆			☆		☆	☆	☆					5	1	1
00000569__	4.54	Mercer	☆			☆	☆	☆							0	0	0
00000571__	38.22	Mercer		☆	☆	☆	☆	☆			☆	☆			0	0	0
00000579__	4.02	Mercer		☆	☆	☆	☆	☆							5	0	0
03000603__	7.05	Burlington		☆	☆	☆	☆	☆							5	0	0
03000603__	8.92	Burlington		☆	☆	☆	☆		☆						0	0	0
03000618__	2.47	Burlington	☆		☆	☆	☆	☆		☆					5	1	1
04000627__	1.1	Camden		☆	☆	☆	☆	☆							1	1	1
04000667__	1.23	Camden	☆		☆	☆	☆	☆							0	0	0
04000706__	11.31	Camden		☆	☆	☆	☆	☆	☆						0	0	0
08000630__	2.35	Gloucester	☆		☆		☆	☆							5	1	0
08000643__	1.19	Gloucester		☆	☆	☆	☆	☆							0	0	0
08000643__	1.98	Gloucester		☆	☆	☆	☆	☆			☆	☆			3	2	0
08000653__	4.82	Gloucester	☆		☆	☆	☆	☆							5	0	0
08000673__	4.42	Gloucester	☆		☆	☆	☆	☆							0	0	0
11000608__	0.55	Mercer		☆	☆	☆	☆	☆							5	1	0
11000615__	0	Mercer	☆	☆		☆		☆	☆						19	3	0
11000616__	1.02	Mercer	☆		☆		☆				☆	☆			0	0	0
11000620__	0.38	Mercer		☆	☆		☆	☆			☆	☆			1	0	0
11000634__	3.71	Mercer		☆	☆		☆				☆				1	0	0
11061001__	0.68	Mercer		☆	☆	☆	☆	☆			☆		☆		2	0	0
11071174__	0.83	Mercer		☆	☆	☆	☆	☆			☆		☆		3	3	0
11131424__	0.6	Mercer		☆	☆	☆	☆	☆			☆	☆			1	0	0
00000064__	0.22	Mercer	☆		☆		☆	☆			☆				4.5	1	0
00000064__	0.29	Mercer		☆	☆	☆	☆	☆			☆				6	0	0
00000518__	11.82	Mercer		☆	☆		☆	☆							1	1	0
00000526__	4.21	Mercer		☆		☆	☆	☆	☆		☆				4.5	4	2
00000526__	7.08	Mercer		☆		☆	☆	☆			☆				4.5	1	0
00000534__	16.36	Camden	☆		☆		☆	☆		☆					4.5	0	0
00000534__	3.38	Camden			☆		☆	☆			☆				4.5	1	1
00000534__	8.39	Camden		☆	☆	☆	☆	☆							4	0	0
00000535__	4.81	Mercer		☆	☆		☆	☆				☆			0	0	0
00000536__	30.13	Camden		☆	☆		☆	☆			☆				2	1	0
00000537__	12.59	Burlington			☆		☆	☆	☆		☆				0	0	0
00000541__	15.9	Burlington		☆	☆		☆	☆			☆				3	0	0
00000541__	0.01	Burlington			☆		☆	☆	☆		☆				0	0	0

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present		Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
00000545	12.87	Burlington	☆		☆			☆	☆		☆			1	0	0	
00000561	35.43	Camden		☆	☆		☆	☆			☆			0	0	0	
00000569	0.28	Mercer		☆	☆		☆	☆			☆			0	0	0	
00000569	5.18	Mercer		☆				☆	☆		☆			2	1	0	
00000569	5.47	Mercer		☆		☆	☆	☆			☆			0	0	0	
00000571	37.75	Mercer			☆		☆	☆	☆			☆		2	1	0	
00000579	4.74	Mercer	☆		☆		☆	☆			☆			0	0	0	
00000583	7.29	Mercer	☆				☆	☆	☆		☆			0	0	0	
00000583	7.45	Mercer		☆			☆	☆		☆	☆			10	4	1	
03000607	10.07	Burlington		☆	☆		☆	☆			☆			0	0	0	
03000612	3.65	Burlington			☆			☆	☆	☆	☆			1	1	1	
03000620	1.87	Burlington	☆				☆	☆	☆		☆			0	0	0	
03000626	8.83	Burlington			☆		☆	☆	☆		☆			1	1	0	
03000630	2.32	Burlington		☆	☆		☆	☆			☆			1	0	0	
03000634	0.26	Burlington		☆	☆	☆					☆			2	0	0	
03000635	2.2	Burlington	☆				☆	☆			☆			1	0	0	
03000644	2.25	Burlington					☆	☆	☆		☆			2	1	0	
03000644	2.34	Burlington		☆			☆	☆	☆				☆	5	2	0	
03000656	2.14	Burlington	☆		☆			☆	☆		☆			0	0	0	
03000660	11.83	Burlington	☆				☆	☆	☆		☆			0	0	0	
03000667	4.25	Burlington		☆			☆	☆	☆		☆			0	0	0	
03241001	3.53	Burlington		☆			☆	☆	☆		☆			0	0	0	
03381411	0.25	Burlington		☆	☆		☆	☆			☆			1	0	0	
03381411	0.35	Burlington		☆	☆		☆	☆			☆			2	2	0	
04000601	3.13	Camden		☆	☆	☆	☆	☆			☆			0	0	0	
04000628	1.62	Camden		☆	☆		☆		☆		☆			0	0	0	
04000635	0.33	Camden		☆	☆		☆	☆	☆		☆			2	1	0	
04000659	2.57	Camden		☆	☆		☆	☆	☆		☆			0	0	0	
04000670	0.64	Camden		☆	☆		☆		☆		☆			1	0	0	
04000671	2.71	Camden	☆				☆	☆	☆		☆			0	0	0	
04000675	8.03	Camden		☆	☆		☆				☆			2	1	0	
04000676	0.41	Camden		☆	☆		☆	☆			☆			0	0	0	
04000681	1.45	Camden	☆		☆		☆	☆			☆			4	3	0	
04000681	1.55	Camden			☆		☆	☆			☆			0	0	0	
04000687	4.68	Camden	☆	☆			☆	☆			☆			2	0	0	
04000706	10.62	Camden		☆	☆		☆	☆			☆			0	0	0	
04081664	0.13	Camden		☆	☆	☆			☆		☆			0	0	0	
08000603	3.59	Gloucester		☆	☆		☆		☆		☆			16	3	0	
08000603	7.86	Gloucester		☆	☆		☆		☆		☆			2	0	0	
08000608	1.28	Gloucester	☆	☆	☆		☆	☆			☆			0	0	0	
08000608	1.99	Gloucester		☆	☆		☆	☆			☆			7	3	0	
08000613	0.6	Gloucester		☆	☆					☆	☆			7	1	1	
08000613	0.88	Gloucester		☆	☆			☆			☆			4	3	0	
08000615	2.1	Gloucester	☆		☆			☆	☆	☆	☆			3	3	1	
08000634	2.6	Gloucester		☆	☆	☆	☆	☆			☆			0	0	0	
08000635	6.54	Gloucester		☆	☆			☆	☆		☆			1	1	0	
08000639	4.66	Gloucester		☆	☆		☆	☆			☆			0	0	0	
08000639	4.87	Gloucester		☆	☆		☆	☆			☆			0	0	0	
08000667	14.7	Gloucester		☆	☆		☆	☆			☆			0	0	0	
08000676	2.07	Gloucester		☆	☆		☆	☆			☆			0	0	0	

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve		Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes		Visual Trap Present	Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)
11000600__	1.03	Mercer	☆	☆		☆		☆			☆			0	0	0
11000608__	0.37	Mercer		☆	☆		☆				☆			2	0	0
11000636__	3.61	Mercer		☆	☆	☆								0	0	0
11000638__	2.44	Mercer	☆				☆	☆	☆		☆			7	2	0
11000638__	3.49	Mercer		☆	☆		☆				☆			1	1	0
11000638__	4.81	Mercer		☆	☆		☆		☆		☆			2	0	0
11000643__	1.01	Mercer		☆	☆		☆	☆			☆			2	0	0
11000653__	1.23	Mercer		☆	☆	☆					☆			4	0	0
11000654__	0.49	Mercer	☆	☆			☆	☆	☆		☆			2	2	0
11021398__	1.44	Mercer	☆	☆	☆		☆				☆			0	0	0
11031973__	0.11	Mercer	☆	☆	☆				☆		☆			0	0	0
11031978__	2.08	Mercer		☆	☆		☆	☆			☆			3	2	0
11031985__	2.98	Mercer		☆	☆	☆					☆			0	0	0
11061010__	3.04	Mercer			☆	☆		☆	☆		☆			0	0	0
11071174__	2.1	Mercer		☆	☆	☆		☆			☆			4	2	0
11121039__	1.71	Mercer	☆			☆		☆	☆		☆			0	0	0
11131420__	1.81	Mercer	☆		☆		☆		☆		☆			0	0	0
11131424_A100160	0.02	Mercer		☆		☆			☆		☆			0	0	0
00000206__	54.51	Mercer		☆	☆	☆	☆				☆		☆	3	1	0
00000206__	54.91	Mercer		☆	☆	☆	☆							4	2	0
00000206__	55.78	Mercer		☆	☆	☆	☆		☆					10	5	0
00000524__	4.24	Mercer	☆				☆	☆	☆					0	0	0
00000530__	11.09	Burlington	☆	☆			☆	☆						1	0	0
00000532__	11.28	Burlington						☆	☆	☆	☆		☆	1	1	1
00000534__	1.84	Gloucester	☆	☆	☆			☆			☆			2	0	0
00000534__	10.7	Camden		☆	☆		☆	☆						0	0	0
00000534__	7.87	Camden		☆	☆	☆		☆		☆	☆	☆		1	0	0
00000535__	1.92	Mercer					☆	☆		☆	☆	☆		7	2	1
00000535__	2.01	Mercer		☆			☆	☆				☆		1	1	0
00000541__	18.2	Burlington			☆		☆	☆			☆	☆		1	0	0
00000543__	22.75	Burlington	☆		☆	☆					☆			0	0	0
00000544__	5.96	Camden	☆		☆		☆		☆					0	0	0
00000546__	2.21	Mercer	☆		☆		☆	☆		☆				3	0	0
00000553A__	5.75	Gloucester		☆	☆		☆	☆						0	0	0
00000557__	32.89	Gloucester		☆			☆	☆	☆					1	0	0
00000561__	36.74	Camden	☆	☆	☆		☆							0	0	0
00000561__	40.44	Camden		☆	☆		☆	☆						1	0	0
00000563__	34.82	Burlington		☆		☆		☆	☆					0	0	0
00000569__	2.35	Mercer	☆				☆		☆					0	0	0
00000569__	6.93	Mercer	☆	☆			☆	☆						3	2	0
00000569__	7.56	Mercer	☆				☆	☆						0	0	0
00000569__	7.91	Mercer		☆		☆		☆						0	0	0
00000571__	40.23	Mercer		☆	☆		☆	☆						4	2	0
03000603__	6.72	Burlington		☆	☆		☆	☆		☆				1	0	1
03000612__	9.87	Burlington		☆		☆								4	0	0
03000613__	3.14	Burlington	☆	☆	☆		☆	☆						0	0	0
03000616__	22.01	Burlington				☆	☆				☆		☆	0	0	0
03000618__	0.75	Burlington	☆	☆	☆		☆	☆						2	0	0
03000635__	5.65	Burlington		☆	☆		☆	☆						3	2	0
03000636__	6.07	Burlington			☆		☆	☆			☆		☆	1	1	0

DVRPC Curves
Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor							Secondary Risk Factor				Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present	Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)	
03000642__	2.51	Burlington	☆	☆				☆			☆		☆	1	0	0	
03000644__	5.14	Burlington		☆		☆	☆	☆						5	2	0	
03000645__	1.65	Burlington		☆				☆		☆	☆		☆	7	5	1	
03000645__	5.32	Burlington				☆		☆	☆		☆		☆	1	0	0	
03000654__	1.04	Burlington		☆		☆		☆			☆		☆	0	0	0	
03000655__	0.08	Burlington		☆	☆		☆				☆		☆	1	0	0	
03000660__	11.45	Burlington		☆	☆	☆		☆						1	0	0	
04000629__	0.49	Camden		☆	☆		☆			☆				2	2	1	
04000670__	2.65	Camden		☆	☆	☆								0	0	0	
04000673__	2.04	Camden		☆	☆		☆				☆	☆		3	1	0	
04000677__	1.03	Camden		☆	☆			☆		☆				3	2	1	
04000702__	3.25	Camden	☆				☆	☆			☆		☆	1	0	0	
04000705__	6.43	Camden		☆			☆	☆		☆				3	2	1	
04000713__	1.37	Camden	☆	☆			☆	☆						0	0	0	
04000740__	0.23	Camden		☆	☆	☆					☆	☆		2	0	0	
08000610__	3.31	Gloucester		☆	☆		☆	☆						0	0	0	
08000623__	2.26	Gloucester		☆	☆		☆	☆						1	1	0	
08000630__	0.09	Gloucester		☆	☆		☆				☆	☆		0	0	0	
08000651__	0.2	Gloucester				☆	☆		☆					0	0	0	
08000651__	4.18	Gloucester		☆	☆		☆	☆						5	0	0	
08000662__	1.15	Gloucester		☆	☆	☆		☆						1	0	0	
08000663__	3.58	Gloucester		☆	☆		☆	☆						1	0	0	
11000616__	0.88	Mercer		☆	☆		☆				☆	☆		0	0	0	
11000624__	1.92	Mercer		☆	☆	☆		☆						1	0	0	
11000634__	0.08	Mercer		☆		☆	☆	☆						3	1	0	
11021036__	0.45	Mercer		☆	☆			☆						0	0	0	
11031810__	0.82	Mercer	☆			☆		☆	☆					0	0	0	
11031990__	0.35	Mercer		☆	☆	☆	☆							1	0	0	
11041056__	0.62	Mercer	☆	☆	☆						☆		☆	1	0	0	
11000608__	0.75	Mercer		☆		☆	☆	☆						2	0	0	
11131512__	0.25	Mercer		☆	☆	☆					☆	☆		21	0	0	
00000206__	52.78	Mercer			☆		☆		☆		☆			1	0	0	
00000206__	53.62	Mercer		☆			☆							1	0	0	
00000524__	3.12	Mercer		☆	☆		☆				☆			1	0	0	
00000524_X100060	0.01	Mercer			☆		☆	☆			☆			0	0	0	
00000526__	9.81	Mercer		☆			☆				☆			3	1	0	
00000528__	1.64	Burlington		☆	☆		☆						☆	0	0	0	
00000528__	9.35	Burlington		☆	☆			☆			☆			0	0	0	
00000532__	14.51	Burlington	☆	☆				☆			☆			0	0	0	
00000532__	7.16	Burlington		☆				☆		☆	☆			3	2	1	
00000533_Y100840	0.02	Mercer			☆		☆	☆		☆	☆			0	0	0	
00000534__	3.47	Camden			☆		☆	☆			☆			0	0	0	
00000534__	3.48	Camden			☆		☆	☆			☆			2	1	0	
00000534__	8.6	Camden		☆	☆		☆				☆			5	2	0	
00000534_X100780	0.03	Camden		☆	☆		☆				☆			0	0	0	
00000535_A100550	0.01	Mercer		☆	☆		☆	☆			☆			0	0	0	
00000536__	32.77	Camden		☆			☆				☆			0	0	0	
000005365	7.51	Camden			☆		☆	☆			☆			0	0	0	
00000537__	12.02	Burlington			☆		☆	☆			☆			0	0	0	
00000537__	19.14	Burlington		☆	☆		☆				☆			5	1	0	

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present		Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
00000537__	19.22	Burlington		☆	☆		☆				☆			4	0	0	
00000538__	15.15	Gloucester	☆					☆	☆		☆			1	0	0	
00000538__	23.89	Gloucester	☆	☆				☆			☆			7	1	0	
00000541__	11.45	Burlington			☆		☆				☆			0	0	0	
00000541__	14.76	Burlington		☆	☆		☆				☆			2	1	0	
00000541__	7.25	Burlington		☆	☆		☆				☆			0	0	0	
00000541__	21.84	Burlington			☆		☆	☆			☆			0	0	0	
00000541_X101940	0	Burlington			☆		☆				☆			0	0	0	
00000542__	14.84	Burlington		☆			☆	☆			☆			0	0	0	
00000542__	17.64	Burlington	☆	☆				☆			☆			1	1	0	
00000543__	11.09	Burlington	☆				☆				☆			1	0	0	
00000543__	14.55	Burlington			☆		☆	☆			☆			0	0	0	
00000543__	14.6	Burlington			☆		☆	☆			☆			1	1	0	
00000543__	25.95	Burlington				☆		☆	☆		☆			0	0	0	
00000545__	5.38	Burlington		☆	☆		☆				☆			0	0	0	
00000545__	6.69	Burlington		☆			☆	☆				☆		2	1	0	
00000545__	7.01	Burlington		☆				☆	☆		☆			1	0	0	
00000546__	8.04	Mercer		☆	☆		☆				☆			0	0	0	
00000546__	8.06	Mercer		☆	☆		☆		☆		☆			0	0	0	
00000553__	41.9	Gloucester		☆	☆		☆				☆			5	0	0	
00000553__	51.19	Gloucester		☆	☆		☆	☆			☆			2	1	0	
00000553A__	2.85	Gloucester			☆		☆	☆			☆			1	1	0	
00000553A__	3.94	Gloucester		☆	☆		☆				☆			2	1	0	
00000553A__	4.49	Gloucester			☆		☆	☆			☆			0	0	0	
00000553A__	4.82	Gloucester			☆		☆	☆			☆			0	0	0	
00000555__	23.22	Gloucester		☆				☆		☆				9	6	1	
00000557__	31.24	Gloucester					☆	☆	☆		☆			0	0	0	
00000569__	0.69	Mercer		☆			☆	☆			☆			1	0	0	
00000569__	2	Mercer		☆			☆	☆			☆			0	0	0	
00000571__	37.13	Mercer			☆		☆	☆				☆		0	0	0	
00000571__	37.53	Mercer				☆	☆					☆		0	0	0	
00000579__	0.14	Mercer		☆	☆			☆			☆			5	2	0	
00000533__	10.42	Mercer		☆			☆	☆			☆			5	0	0	
03000603__	7.98	Burlington			☆	☆					☆			0	0	0	
03000606__	0.11	Burlington		☆	☆		☆				☆			0	0	0	
03000608__	3.56	Burlington		☆	☆		☆				☆			0	0	0	
03000611__	0.75	Burlington		☆	☆		☆				☆			2	1	0	
03000612__	8.85	Burlington		☆				☆	☆		☆			1	1	0	
03000613__	5.14	Burlington		☆	☆		☆				☆			3	0	0	
03000616__	12.02	Burlington	☆	☆				☆			☆			0	0	0	
03000616__	19.69	Burlington		☆		☆	☆				☆			0	0	0	
03000616__	23.91	Burlington		☆	☆		☆				☆			0	0	0	
03000616__	27.05	Burlington		☆	☆		☆	☆			☆			0	0	0	
03000616__	5.14	Burlington			☆		☆				☆			0	0	0	
03000620__	0.52	Burlington		☆	☆		☆				☆			5	1	0	
03000621__	0.53	Burlington	☆	☆				☆			☆			0	0	0	
03000623__	1.81	Burlington				1.81	☆	☆	☆		☆			0	0	0	
03000625__	0.08	Burlington		☆			☆				☆			0	0	0	
03000626_A100420	0.01	Burlington			☆		☆	☆			☆			0	0	0	
03000626_X100590	0.02	Burlington					☆	☆	☆		☆			0	0	0	

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present		Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
03000630	6.18	Burlington					☆	☆	☆		☆			3.5	0	0	0
03000632	0.43	Burlington		☆	☆		☆				☆			3.5	0	0	0
03000633	2.08	Burlington		☆	☆		☆				☆			3.5	0	0	0
03000634	0.04	Burlington		☆	☆		☆				☆			3.5	0	0	0
03000653	0.5	Burlington	☆	☆				☆			☆			3.5	2	0	0
03000654	0.68	Burlington	☆	☆				☆			☆			3.5	0	0	0
03000656	3.87	Burlington		☆	☆			☆			☆			3.5	1	0	0
03000656	5.21	Burlington	☆	☆	☆						☆			3.5	2	0	0
03000660	4.52	Burlington			☆			☆	☆		☆			3.5	1	0	0
03000662	0.78	Burlington		☆	☆			☆			☆			3.5	1	0	0
03000667	1.04	Burlington		☆	☆				☆		☆			3.5	1	0	0
03000667	1.19	Burlington		☆	☆				☆		☆			3.5	1	1	0
03000670	3.94	Burlington	☆		☆			☆			☆			3.5	3	1	0
03000670	4.69	Burlington		☆				☆	☆		☆			3.5	2	2	0
03000677	0.15	Burlington		☆	☆			☆			☆			3.5	0	0	0
00000528	4.55	Burlington		☆					☆		☆			3.5	1	0	0
03241001	2.1	Burlington		☆			☆	☆			☆			3.5	3	1	0
03241001	2.77	Burlington			☆		☆	☆			☆			3.5	0	0	0
03331043	1.03	Burlington				☆		☆	☆				☆	3.5	4	2	0
03341039	1.1	Burlington		☆	☆		☆				☆			3.5	1	0	0
03381105	0.03	Burlington		☆	☆			☆			☆			3.5	0	0	0
03381105	0.27	Burlington		☆	☆			☆			☆			3.5	4	2	0
040006122	0.31	Camden		☆	☆				☆		☆			3.5	2	1	0
04000615	1.31	Camden		☆	☆		☆				☆			3.5	2	0	0
04000626	2.02	Camden		☆	☆		☆				☆			3.5	1	1	0
04000627	0.21	Camden			☆			☆			☆			3.5	0	0	0
04000629	0.15	Camden			☆	☆	☆				☆			3.5	0	0	0
04000629	0.36	Camden		☆	☆						☆			3.5	3	0	0
04000629	1.12	Camden		☆	☆		☆				☆			3.5	2	1	0
04000629	1.42	Camden		☆	☆		☆				☆			3.5	0	0	0
04000629	1.46	Camden		☆	☆		☆				☆			3.5	0	0	0
04000643	0.49	Camden		☆	☆		☆				☆			3.5	0	0	0
04000644	0.55	Camden		☆	☆		☆				☆			3.5	0	0	0
04000653	0.22	Camden		☆	☆		☆				☆			3.5	0	0	0
04000653	0.22	Camden		☆	☆		☆				☆			3.5	0	0	0
04000659	2.22	Camden		☆	☆		☆				☆			3.5	1	0	0
04000659	3.3	Camden		☆	☆		☆				☆			3.5	0	0	0
04000661	0.95	Camden		☆	☆				☆		☆			3.5	1	0	0
040006615	0.01	Camden		☆	☆				☆		☆			3.5	0	0	0
04000667	0.21	Camden			☆		☆		☆		☆			3.5	0	0	0
04000669	2.84	Camden		☆	☆		☆				☆			3.5	3	2	0
04000669	5.7	Camden		☆	☆		☆				☆			3.5	0	0	0
04000670	2.27	Camden		☆	☆		☆				☆			3.5	0	0	0
04000673	1	Camden		☆	☆		☆		☆		☆			3.5	0	0	0
04000673	1.58	Camden		☆	☆		☆				☆	☆		3.5	1	1	0
04000677	1.29	Camden		☆	☆			☆			☆			3.5	0	0	0
04000679	0.4	Camden	☆	☆	☆						☆			3.5	0	0	0
00000534	7.82	Camden		☆	☆		☆				☆			3.5	0	0	0
04000688	2.42	Camden		☆	☆		☆	☆			☆			3.5	2	1	0
04000691	2.89	Camden		☆			☆	☆				☆		3.5	7	4	0

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve		Primary Risk Factor					Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present
04000691__	3.06	Camden		☆			☆	☆			☆		
04000702__	3.33	Camden	☆				☆	☆				0	0
04000706__	9.64	Camden		☆	☆		☆				☆	0	0
04000710__	1.39	Camden	☆	☆			☆				☆	0	0
04000712__	1.01	Camden		☆			☆	☆			☆	12	2
04000712__	1.17	Camden	☆				☆	☆			☆	0	0
04000722__	2.07	Camden	☆	☆			☆	☆			☆	0	0
04000753__	1.07	Camden			☆		☆		☆		☆	0	0
04000616__	0.31	Camden		☆	☆		☆				☆	1	0
08000603__	3.4	Gloucester		☆	☆		☆				☆	5	2
08000603__	3.76	Gloucester	☆		☆		☆				☆	0	0
08000608__	1.06	Gloucester		☆	☆			☆			☆	0	0
08000608__	1.4	Gloucester		☆	☆			☆			☆	0	0
08000609__	7.74	Gloucester		☆	☆			☆			☆	0	0
08000620__	8.3	Gloucester	☆			☆		☆			☆	0	0
08000621__	1.9	Gloucester	☆		☆		☆				☆	0	0
08000624__	4.31	Gloucester	☆		☆		☆	☆			☆	0	0
08000624__	4.36	Gloucester		☆	☆		☆				☆	1	0
08000624__	4.77	Gloucester		☆	☆		☆				☆	0	0
08000626__	1.22	Gloucester		☆	☆			☆			☆	0	0
08000627__	1.68	Gloucester		☆	☆	☆					☆	0	0
08000632__	1.16	Gloucester		☆	☆		☆				☆	2	0
08000635__	3.26	Gloucester	☆		☆			☆			☆	1	0
08000635__	3.4	Gloucester		☆	☆			☆			☆	10	4
08000635__	4.82	Gloucester		☆	☆			☆			☆	1	1
08000635__	5.21	Gloucester	☆		☆			☆			☆	0	0
08000635__	5.49	Gloucester		☆	☆			☆			☆	2	1
08000635__	6.34	Gloucester			☆			☆	☆		☆	0	0
08000637__	0.98	Gloucester		☆	☆			☆			☆	0	0
08000637__	0.98	Gloucester		☆	☆			☆			☆	0	0
08000639__	1.36	Gloucester		☆	☆			☆			☆	1	0
08000639__	1.72	Gloucester	☆		☆			☆			☆	0	0
08000641__	1.82	Gloucester	☆	☆				☆			☆	0	0
08000641__	4.86	Gloucester	☆		☆		☆				☆	4	2
08000642__	2.38	Gloucester		☆	☆		☆				☆	1	0
08000644__	2.21	Gloucester		☆	☆		☆				☆	0	0
08000646__	0.06	Gloucester		☆	☆			☆	☆		☆	1	1
08000653__	2.54	Gloucester	☆					☆		☆	☆	3	1
08000655__	1.59	Gloucester		☆			☆	☆			☆	9	7
08000656__	2.47	Gloucester			☆		☆	☆			☆	0	0
08000663__	0.06	Gloucester	☆		☆		☆				☆	0	0
08000663__	4.68	Gloucester		☆	☆		☆				☆	1	0
08000663__	4.8	Gloucester		☆	☆		☆				☆	6	2
08000663__	4.94	Gloucester		☆	☆		☆				☆	3	0
08000676__	1.67	Gloucester			☆		☆	☆			☆	1	0
08000694__	0.16	Gloucester	☆	☆	☆		☆				☆	1	1
08111126__	0.02	Gloucester		☆	☆		☆				☆	0	0
11000600__	0.87	Mercer				☆	☆	☆	☆		☆	0	0
11000611__	0.47	Mercer			☆		☆	☆			☆	0	0
11000611__	1.61	Mercer					☆	☆	☆		☆	1	1

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present		Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
11000615	0.39	Mercer	☆	☆	☆						☆			2	0	0	
11000616	0.7	Mercer		☆	☆		☆				☆			1	0	0	
11000620	0.95	Mercer			☆		☆	☆				☆		0	0	0	
11000620_Y100210	0	Mercer		☆			☆				☆			0	0	0	
11000623	0.36	Mercer				☆		☆	☆					0	0	0	
11000623	0.78	Mercer				☆		☆			☆			0	0	0	
11000623	1.3	Mercer		☆				☆	☆		☆			0	0	0	
11000629	0.5	Mercer	☆		☆		☆				☆			0	0	0	
11000629	0.68	Mercer	☆				☆		☆		☆			2	2	0	
11000634	1.48	Mercer		☆	☆		☆				☆			2	0	0	
11000634	4.83	Mercer		☆	☆		☆				☆			1	0	0	
11000636	0.68	Mercer		☆	☆		☆				☆			1	1	0	
11000636	1.15	Mercer		☆	☆		☆				☆			2	0	0	
11000636	3.99	Mercer		☆	☆		☆				☆			0	0	0	
11000636	4.67	Mercer			☆		☆		☆		☆			0	0	0	
11000638	0.49	Mercer	☆	☆				☆			☆			0	0	0	
11000638	4.92	Mercer	☆		☆		☆				☆			1	1	0	
11000640	1.98	Mercer	☆		☆		☆				☆			0	0	0	
11000643	2.72	Mercer		☆	☆		☆				☆			3	0	0	
11000647	1.62	Mercer				☆		☆	☆		☆			1	0	0	
11000649	0.86	Mercer			☆		☆	☆			☆			1	1	0	
11000654	0.89	Mercer	☆					☆	☆		☆			0	0	0	
11000654	1.1	Mercer	☆					☆	☆		☆			7	2	0	
11011147	0.46	Mercer		☆	☆			☆			☆			3	1	0	
11021036	0.08	Mercer			☆	☆		☆	☆		☆			0	0	0	
11021036	1.24	Mercer		☆	☆			☆			☆			0	0	0	
11021036	1.33	Mercer		☆	☆			☆			☆			0	0	0	
11031810	1.21	Mercer	☆					☆	☆		☆			0	0	0	
11031976	0.16	Mercer	☆	☆			☆				☆			0	0	0	
11031976	0.4	Mercer	☆	☆	☆		☆				☆			0	0	0	
11031976	1.69	Mercer	☆	☆			☆				☆			0	0	0	
11031976	2.58	Mercer			☆		☆	☆			☆			0	0	0	
11031990	0.66	Mercer		☆	☆		☆				☆			1	0	0	
11031996	1.2	Mercer		☆	☆			☆			☆			6	2	0	
11031997	0.08	Mercer		☆	☆		☆				☆			0	0	0	
11032003	0.52	Mercer	☆	☆	☆			☆			☆			0	0	0	
11061001	0.88	Mercer		☆	☆			☆			☆			0	0	0	
11061002	0.55	Mercer			☆			☆	☆		☆			0	0	0	
11061004	0.15	Mercer		☆	☆		☆				☆			0	0	0	
11071174	1.07	Mercer				☆		☆	☆		☆			0	0	0	
11072002	0.66	Mercer	☆	☆			☆				☆			0	0	0	
11072002	0.94	Mercer	☆	☆			☆				☆			0	0	0	
11072002	1.57	Mercer	☆		☆		☆				☆			0	0	0	
11072002	1.81	Mercer		☆	☆		☆				☆			1	1	0	
11111526	0.06	Mercer	☆		☆		☆				☆			0	0	0	
11111567	0.02	Mercer	☆		☆		☆				☆			0	0	0	
11121039	1.89	Mercer	☆					☆	☆		☆			0	0	0	
1121039	2	Mercer	☆	☆				☆			☆			0	0	0	
1121136	0	Mercer		☆	☆			☆			☆			0	0	0	
1131041	1.52	Mercer		☆		☆	☆				☆			2	1	0	

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve		Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes		Visual Trap Present	Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)
11131141__	1.56	Mercer				☆		☆	☆		☆			0	0	0
11131143__	2.64	Mercer		☆	☆		☆				☆			0	0	0
11131143__	2.85	Mercer		☆	☆		☆				☆			0	0	0
11131143__	3.01	Mercer		☆			☆				☆			2	1	0
11131419__	0.34	Mercer	☆		☆				☆		☆			0	0	0
11141245__	0.69	Mercer		☆		☆					☆			0	0	0
11142030__	1.82	Mercer		☆		☆		☆			☆			4	1	0
11142030__	1.86	Mercer	☆	☆				☆			☆			0	0	0
11142086__	1.16	Mercer		☆	☆		☆				☆			0	0	0
11142239__	1.54	Mercer		☆	☆		☆				☆			1	0	0
11142241__	0.92	Mercer		☆	☆		☆				☆			0	0	0
00000524__	3.56	Mercer		☆			☆	☆						1	0	0
00000524__	3.9	Mercer		☆			☆	☆						0	0	0
00000524__	3.97	Mercer		☆			☆	☆						0	0	0
00000530__	11.58	Burlington				☆		☆						1	0	0
00000530__	12.59	Burlington					☆	☆		☆				5	2	1
00000530__	13.64	Burlington		☆			☆	☆						0	0	0
00000534__	2.92	Gloucester		☆	☆			☆						0	0	0
00000534__	3.19	Gloucester		☆	☆			☆						0	0	0
00000541__	0.24	Burlington		☆			☆	☆						0	0	0
00000541__	10.23	Burlington		☆	☆		☆	☆						53	5	0
00000543__	25.52	Burlington		☆	☆			☆						1	0	0
00000543__	4.7	Camden			☆		☆	☆						0	0	0
00000551__	22.88	Gloucester	☆		☆		☆	☆						0	0	0
00000551__	23.07	Gloucester	☆		☆		☆	☆						1	0	0
00000553A__	2.58	Gloucester			☆		☆	☆						0	0	0
00000553A__	5.11	Gloucester			☆		☆	☆						0	0	0
00000553A__	5.88	Gloucester		☆	☆		☆	☆						0	0	0
00000555__	18.91	Gloucester	☆			☆		☆						0	0	0
00000555__	19.47	Gloucester		☆		☆		☆						2	0	0
00000557__	31.5	Gloucester				☆	☆	☆						0	0	0
00000557__	32.08	Gloucester				☆	☆	☆						0	0	0
00000561__	36.63	Camden		☆	☆		☆	☆						0	0	0
00000563__	30.23	Burlington		☆		☆		☆						2	1	0
00000563__	31.61	Burlington		☆		☆		☆						0	0	0
00000563__	39.34	Burlington		☆	☆	☆		☆						0	0	0
00000569__	3.73	Mercer		☆			☆	☆						3	1	0
00000579__	1.25	Mercer			☆			☆	☆					0	0	0
00000579__	10.09	Mercer		☆			☆	☆						2	1	0
00000579__	4.67	Mercer			☆		☆	☆						0	0	0
00000579__	5.08	Mercer				☆	☆	☆						2	0	0
00000579__	6.26	Mercer		☆			☆	☆						2	1	0
00000579__	7.2	Mercer		☆			☆	☆						1	1	0
00000579__	7.28	Mercer		☆			☆	☆						0	0	0
03000616__	9.04	Burlington		☆		☆		☆						0	0	0
03000616__	9.74	Burlington	☆	☆				☆						1	0	0
03000618__	1.75	Burlington			☆		☆	☆						1	0	0
03000620__	4.03	Burlington			☆		☆	☆						2	0	0
03000626__	7.67	Burlington		☆			☆	☆						1	1	0
03000646__	2.93	Burlington				☆		☆	☆					0	0	0

DVRPC Curves
Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present		Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
03000646	4.85	Burlington	☆	☆							☆		☆	3	2	2	0
03000648	8.26	Burlington		☆				☆					☆	3	1	0	0
03000652	0.14	Burlington	☆	☆							☆		☆	3	0	0	0
03000660	10.06	Burlington		☆				☆	☆					3	2	0	0
03000660	12.13	Burlington		☆				☆			☆		☆	3	0	0	0
03000660	13.35	Burlington		☆	☆						☆		☆	3	0	0	0
03000660	3.41	Burlington		☆				☆			☆		☆	3	0	0	0
03000660	9.64	Burlington						☆	☆		☆		☆	3	1	0	0
03000665	3.5	Burlington		☆				☆						3	1	0	0
03000667	0.69	Burlington		☆	☆						☆		☆	3	7	2	0
03201270	1.21	Burlington				☆	☆	☆						3	0	0	0
03241061	0.97	Burlington		☆			☆				☆		☆	3	2	0	0
03381409	1.46	Burlington		☆	☆			☆						3	3	0	0
04000628	0.81	Camden		☆	☆		☆							3	4	2	0
04000628	1.25	Camden			☆	☆	☆							3	0	0	0
04000628	1.29	Camden		☆	☆		☆							3	3	1	0
04000635	2.27	Camden		☆	☆		☆							3	0	0	0
04000637	0.07	Camden		☆	☆		☆							3	1	0	0
04000659	1.89	Camden		☆	☆		☆							3	2	0	0
04000661	0.62	Camden		☆	☆						☆		☆	3	0	0	0
04000670	2.7	Camden		☆	☆		☆							3	0	0	0
04000670	3.13	Camden			☆		☆	☆			☆			3	1	1	0
04000673	2.23	Camden			☆		☆						☆	3	0	0	0
04000677	0.66	Camden		☆	☆			☆						3	0	0	0
04000705	7.25	Camden	☆				☆	☆						3	0	0	0
04000713	1	Camden		☆			☆	☆						3	2	1	0
04000713	1.41	Camden	☆				☆	☆						3	0	0	0
04000713	3.03	Camden	☆				☆	☆						3	0	0	0
04000716	4.64	Camden		☆			☆							3	0	0	0
04000720	7.4	Camden					☆	☆	☆					3	3	0	0
04091657	0.71	Camden		☆	☆						☆		☆	3	0	0	0
04271596	0.06	Camden		☆	☆						☆			3	0	0	0
08000603	4.46	Gloucester			☆		☆	☆						3	0	0	0
08000603	8.66	Gloucester	☆		☆		☆							3	0	0	0
08000620	4.1	Gloucester		☆	☆			☆						3	0	0	0
08000623	3.72	Gloucester	☆				☆	☆						3	0	0	0
08000626	0.98	Gloucester		☆				☆	☆					3	0	0	0
08000653	3.94	Gloucester	☆			☆		☆						3	1	1	0
08000653	5.03	Gloucester	☆				☆							3	0	0	0
08000662	1.35	Gloucester			☆	☆		☆	☆					3	1	0	0
08000667	3.66	Gloucester	☆		☆			☆						3	0	0	0
08000667	8.83	Gloucester		☆	☆			☆						3	0	0	0
08000673	1.46	Gloucester	☆	☆				☆						3	0	0	0
08000689	3.8	Gloucester	☆				☆	☆						3	0	0	0
08000689	4.12	Gloucester					☆	☆			☆			3	0	0	0
08000694	3.47	Gloucester	☆	☆				☆						3	0	0	0
11000636	4.03	Mercer	☆		☆		☆							3	0	0	0
11000636	5.26	Mercer	☆		☆		☆							3	0	0	0
11000636	5.46	Mercer	☆		☆		☆							3	0	0	0
11000640	0.43	Mercer	☆	☆			☆							3	1	0	0

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present		Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
11021036__	0.85	Mercer		☆	☆			☆						3	0	0	0
11031990__	2.81	Mercer		☆	☆		☆							3	2	0	0
11061002__	5.53	Mercer		☆	☆				☆					3	0	0	0
11061010__	2.14	Mercer		☆				☆	☆					3	1	1	0
11061010__	3.76	Mercer						☆	☆		☆		☆	3	0	0	0
11131143__	2.61	Mercer		☆	☆		☆							3	0	0	0
11131193__	0.67	Mercer		☆	☆						☆	☆		3	0	0	0
000002062__	44.95	Mercer		☆			☆							2.5	4	1	0
00000528__	6.33	Burlington	☆					☆			☆			2.5	0	0	0
00000528__	8.79	Burlington	☆		☆						☆			2.5	1	1	0
00000532__	14.85	Burlington	☆					☆			☆			2.5	0	0	0
00000532__	15.52	Burlington		☆				☆			☆			2.5	0	0	0
00000532__	19.35	Burlington						☆	☆		☆			2.5	0	0	0
00000532__	8.13	Burlington	☆					☆			☆			2.5	0	0	0
00000533__	10.63	Mercer	☆	☆										2.5	0	0	0
00000533__	9.04	Mercer				☆		☆			☆			2.5	1	0	0
00000534__	8.49	Camden			☆		☆				☆			2.5	0	0	0
00000534__	8.69	Camden			☆		☆				☆			2.5	2	2	0
00000535__	0	Mercer			☆		☆				☆			2.5	14	1	0
00000538__	23.63	Gloucester						☆	☆		☆			2.5	2	1	0
00000539__	47.12	Mercer		☆				☆			☆			2.5	0	0	0
00000539__	48.02	Mercer	☆					☆			☆			2.5	0	0	0
00000539__	50.22	Mercer			☆			☆			☆			2.5	2	1	0
00000541__	11.74	Burlington					☆	☆			☆			2.5	4	2	0
00000541__	12.07	Burlington					☆	☆			☆			2.5	1	0	0
00000541__	14.44	Burlington			☆		☆				☆			2.5	0	0	0
00000541__	A101920	Burlington					☆	☆			☆			2.5	0	0	0
00000541__	Z101840	Burlington			☆		☆				☆			2.5	0	0	0
00000542__	10.38	Burlington	☆					☆			☆			2.5	1	1	0
00000542__	10.76	Burlington		☆				☆			☆			2.5	1	1	0
00000542__	12.18	Burlington	☆					☆			☆			2.5	0	0	0
00000542__	14.35	Burlington		☆				☆			☆			2.5	0	0	0
00000542__	18.23	Burlington	☆					☆			☆			2.5	0	0	0
00000542__	8.25	Burlington		☆				☆			☆			2.5	0	0	0
00000543__	13.44	Burlington		☆			☆				☆			2.5	3	2	0
00000543__	24.96	Burlington			☆			☆			☆			2.5	0	0	0
00000543__	26.69	Burlington				☆		☆			☆			2.5	2	2	0
00000545__	13.28	Burlington						☆			☆			2.5	0	0	0
00000551__	29.99	Camden		☆			☆				☆			2.5	1	1	0
00000555__	24.64	Gloucester		☆				☆			☆			2.5	7	3	0
00000563__	43.81	Burlington		☆				☆			☆			2.5	0	0	0
00000569__	0.51	Mercer					☆				☆			2.5	0	0	0
00000569__	1.78	Mercer					☆	☆			☆			2.5	0	0	0
00000569__	1.89	Mercer					☆				☆			2.5	0	0	0
00000571__	31.73	Mercer		☆					☆		☆			2.5	5	2	0
00000571__	32.43	Mercer		☆			☆				☆			2.5	0	0	0
00000571__	32.72	Mercer		☆							☆			2.5	0	0	0
00000579__	0.46	Mercer			☆			☆			☆			2.5	0	0	0
00000579__	1.5	Mercer			☆			☆			☆			2.5	0	0	0
00000579__	1.59	Mercer			☆			☆			☆			2.5	0	0	0

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present		Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
00000579__	1.67	Mercer			☆			☆			☆			2.5	1	0	0
00000579__	10.48	Mercer					☆				☆			2.5	0	0	0
00000579__	10.89	Mercer					☆	☆			☆			2.5	0	0	0
00000579__	6.37	Mercer					☆	☆			☆			2.5	0	0	0
00000579__	8.78	Mercer					☆			☆				2.5	1	1	1
03000603__	5.38	Burlington			☆		☆				☆			2.5	0	0	0
03000608__	3.02	Burlington			☆		☆				☆			2.5	0	0	0
03000610__	0.04	Burlington		☆	☆						☆			2.5	0	0	0
03000612__	2.69	Burlington		☆	☆						☆			2.5	0	0	0
03000612__	8.52	Burlington		☆					☆		☆			2.5	1	0	0
03000612__	8.74	Burlington	☆					☆			☆			2.5	1	0	0
03000614__	2.29	Burlington		☆			☆				☆			2.5	2	0	0
03000616__	10.98	Burlington		☆				☆			☆			2.5	0	0	0
03000616__	13.08	Burlington	☆		☆						☆			2.5	0	0	0
03000616__	15.96	Burlington		☆				☆			☆			2.5	0	0	0
03000616__	16.4	Burlington		☆				☆			☆			2.5	2	1	0
03000620__	9.02	Burlington		☆					☆		☆			2.5	0	0	0
03000623__	0.66	Burlington		☆			☆				☆			2.5	2	1	0
03000624__	0.51	Burlington			☆			☆			☆			2.5	0	0	0
03000626__	8.34	Burlington					☆				☆			2.5	1	0	0
03000626_Y100420	0	Burlington			☆		☆				☆			2.5	0	0	0
03000626_Y100420	0.05	Burlington			☆		☆				☆			2.5	0	0	0
03000628__	0.01	Burlington		☆	☆						☆			2.5	1	1	0
03000628__	7.65	Burlington		☆				☆			☆			2.5	0	0	0
03000630__	6.46	Burlington					☆				☆			2.5	1	0	0
03000646__	3.3	Burlington					☆				☆			2.5	0	0	0
03000646__	4.33	Burlington						☆	☆		☆			2.5	2	1	0
03000648__	1.99	Burlington		☆				☆			☆			2.5	0	0	0
03000654__	0.84	Burlington	☆					☆			☆			2.5	0	0	0
03000654__	2.22	Burlington	☆					☆			☆			2.5	0	0	0
03000654__	2.32	Burlington		☆				☆			☆			2.5	0	0	0
03000654__	2.43	Burlington	☆					☆			☆			2.5	0	0	0
03000656__	1.24	Burlington			☆			☆			☆			2.5	0	0	0
03000656__	2.09	Burlington			☆			☆			☆			2.5	2	1	0
03000656__	3.31	Burlington			☆			☆			☆			2.5	1	0	0
03000660__	8.64	Burlington				☆		☆			☆			2.5	2	1	0
03000665__	4.72	Burlington		☆				☆			☆			2.5	1	0	0
03000666__	1.23	Burlington		☆				☆			☆			2.5	1	1	0
03000667__	0.59	Burlington	☆		☆						☆			2.5	0	0	0
03000667__	0.79	Burlington		☆	☆						☆			2.5	0	0	0
03000667__	0.95	Burlington		☆	☆						☆			2.5	1	0	0
03000667__	0.99	Burlington		☆	☆						☆			2.5	0	0	0
03000667__	1.13	Burlington		☆	☆						☆			2.5	1	1	0
03000667__	1.17	Burlington		☆							☆			2.5	0	0	0
03000667__	2.01	Burlington			☆	☆			☆		☆			2.5	0	0	0
03000667__	4.98	Burlington		☆				☆			☆			2.5	0	0	0
03000670__	3.89	Burlington		☆				☆			☆			2.5	1	0	0
03000670__	7.85	Burlington						☆	☆		☆			2.5	0	0	0
03000670__	7.98	Burlington		☆				☆			☆			2.5	4	1	0
03000670__	9.7	Burlington		☆				☆			☆			2.5	1	1	0

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor										Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present	Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)		Fatal and Severe Injury Lane Departure (KA)		
03000679	1.44	Burlington		☆				☆						☆	2.5	0	0		
03000691	0.61	Burlington		☆			☆				☆				2.5	1	0		
03061019	0.17	Burlington			☆		☆				☆				2.5	0	0		
03121087	0.05	Burlington		☆			☆				☆				2.5	0	0		
03121087	0.38	Burlington		☆			☆				☆				2.5	3	1		
03131268	1.39	Burlington		☆				☆			☆				2.5	5	0		
03131375	0.03	Burlington		☆					☆		☆				2.5	3	0		
03131385	0.05	Burlington		☆							☆				2.5	4	0		
03221252	0.32	Burlington		☆	☆						☆				2.5	1	0		
03241276	0.59	Burlington		☆					☆		☆				2.5	0	0		
03241276	0.65	Burlington		☆	☆						☆				2.5	1	0		
03331020	1.66	Burlington						☆			☆				2.5	1	0		
04000611	0.07	Camden			☆		☆				☆				2.5	0	0		
040006121	0.49	Camden		☆	☆						☆				2.5	0	0		
040006123	1.31	Camden			☆		☆				☆				2.5	0	0		
04000613	0.54	Camden		☆	☆						☆				2.5	0	0		
04000615	0.68	Camden			☆		☆				☆				2.5	0	0		
04000615	0.88	Camden			☆		☆				☆				2.5	0	0		
04000624	0.26	Camden			☆				☆		☆				2.5	0	0		
04000629	0.63	Camden			☆		☆				☆				2.5	0	0		
04000629	0.65	Camden			☆		☆				☆				2.5	0	0		
04000629	0.9	Camden			☆		☆				☆				2.5	0	0		
04000629	0.94	Camden			☆		☆				☆				2.5	0	0		
04000629	1.2	Camden			☆		☆				☆				2.5	1	0		
04000641	1.29	Camden		☆	☆						☆				2.5	1	0		
04000644	0.07	Camden			☆		☆				☆				2.5	0	0		
04000647	0.55	Camden		☆	☆						☆				2.5	0	0		
04000647	0.83	Camden		☆	☆						☆				2.5	0	0		
04000648	0.37	Camden		☆	☆						☆				2.5	0	0		
04000648	0.57	Camden		☆	☆						☆				2.5	0	0		
04000650	0.23	Camden		☆	☆						☆				2.5	1	0		
04000654	0.49	Camden			☆		☆				☆				2.5	1	0		
04000656	0.07	Camden			☆		☆				☆				2.5	1	0		
04000659	3.66	Camden			☆		☆				☆				2.5	0	0		
04000660	0.19	Camden	☆		☆						☆				2.5	0	0		
04000660	0.35	Camden		☆	☆						☆				2.5	0	0		
04000660	0.46	Camden		☆	☆						☆				2.5	0	0		
04000660	0.56	Camden		☆	☆						☆				2.5	0	0		
04000661	0.43	Camden		☆	☆						☆				2.5	0	0		
04000661	0.86	Camden		☆	☆						☆				2.5	0	0		
04000668	0.87	Camden		☆	☆						☆				2.5	0	0		
04000668	1.2	Camden		☆	☆						☆				2.5	0	0		
04000673	0.78	Camden	☆		☆		☆				☆				2.5	0	0		
04000673	1.91	Camden			☆		☆				☆	☆			2.5	0	0		
04000673	2.11	Camden			☆		☆				☆				2.5	2	0		
04000675	0.18	Camden					☆								2.5	0	0		
04000675	7.19	Camden	☆	☆			☆				☆				2.5	0	0		
04000677	0.44	Camden		☆	☆						☆				2.5	0	0		
04000679	0.25	Camden		☆	☆						☆				2.5	0	0		
04000682	0.35	Camden		☆	☆						☆				2.5	0	0		

DVRPC Curves
Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor										Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6% 8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present	Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)		Fatal and Severe Injury Lane Departure (KA)		
04000682	0.78	Camden		☆	☆						☆			1	1	0			
04000684	0.98	Camden			☆		☆				☆			0	0	0			
04000685	1.89	Camden		☆				☆			☆			0	0	0			
04000688	1.17	Camden					☆	☆			☆			1	1	0			
04000690	1.37	Camden		☆	☆						☆			0	0	0			
04000692	0.42	Camden		☆			☆				☆			0	0	0			
04000692	0.82	Camden		☆			☆				☆			0	0	0			
04000692	1.16	Camden		☆			☆				☆			0	0	0			
04000693	0.93	Camden					☆		☆		☆			0	0	0			
04000701	0.38	Camden		☆		☆					☆			1	0	0			
04000702	3.93	Camden		☆					☆		☆			0	0	0			
04000703	0.23	Camden		☆			☆				☆			0	0	0			
04000703	1.97	Camden		☆			☆				☆			4	3	0			
04000704	1.48	Camden		☆				☆			☆			2	0	0			
04000710	0.01	Camden		☆			☆				☆			0	0	0			
04000710	0.97	Camden	☆				☆				☆			0	0	0			
04000719	2.42	Camden	☆	☆							☆			0	0	0			
04081614	0.29	Camden		☆	☆						☆			0	0	0			
04081664	0.06	Camden		☆	☆						☆			0	0	0			
04091963	0.72	Camden			☆		☆				☆			1	1	0			
04091982	1.02	Camden		☆					☆		☆			0	0	0			
04161136	0.11	Camden		☆		☆					☆			0	0	0			
04271549	1.42	Camden		☆		☆					☆			0	0	0			
04271596	0.26	Camden			☆				☆		☆			0	0	0			
04371125	0.39	Camden		☆	☆						☆			1	0	0			
08000601	0.1	Gloucester	☆					☆			☆			0	0	0			
08000603	2.62	Gloucester	☆		☆						☆			2	0	0			
08000603	6.74	Gloucester			☆		☆				☆			0	0	0			
08000604	2.63	Gloucester		☆	☆						☆			4	1	0			
08000607	2.4	Gloucester						☆	☆		☆			0	0	0			
08000607	5.06	Gloucester		☆	Gloucester			☆			☆			5	0	0			
08000609	2.57	Gloucester	☆					☆			☆			0	0	0			
08000609	3.18	Gloucester			☆			☆			☆			0	0	0			
08000615	3.86	Gloucester	☆	☆							☆			0	0	0			
08000619	2.76	Gloucester		☆				☆			☆			0	0	0			
08000621	0.56	Gloucester			☆		☆				☆			1	1	0			
08000623	3.27	Gloucester					☆	☆			☆			0	0	0			
08000626	0.26	Gloucester						☆	☆		☆			0	0	0			
08000626	0.35	Gloucester			Gloucester	☆					☆			0	0	0			
08000626	0.7	Gloucester						☆	☆					0	0	0			
08000635	5.7	Gloucester			☆			☆			☆			0	0	0			
08000639	3.54	Gloucester			☆		☆				☆			0	0	0			
08000641	1.96	Gloucester		☆				☆			☆			2	0	0			
08000644	4.46	Gloucester		☆	☆						☆			0	0	0			
08000645	0.18	Gloucester			☆				☆		☆			0	0	0			
08000647	0.45	Gloucester			☆			☆			☆			0	0	0			
08000647	0.6	Gloucester			☆			☆			☆			0	0	0			
08000653	3.4	Gloucester		☆	☆						☆			2	0	0			
08000653	4	Gloucester		☆				☆			☆			1	0	0			
08000658	0.14	Gloucester	☆					☆			☆			2	2	0			

DVRPC Curves
Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6% 8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present		Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
08000658	0.24	Gloucester						☆	☆		☆			1	0	0	
08000662	0.94	Gloucester			☆			☆			☆			1	1	0	
08000664	3.54	Gloucester						☆	☆		☆			0	0	0	
08000664	3.89	Gloucester		☆				☆			☆			1	0	0	
08000667	11.1	Gloucester		☆				☆			☆			0	0	0	
08000667	11.96	Gloucester		☆				☆			☆			0	0	0	
08000667	13.25	Gloucester			☆		☆				☆			0	0	0	
08000694	0.07	Gloucester		☆	☆						☆			0	0	0	
08000712	0.55	Gloucester	☆		☆						☆			0	0	0	
08000712	0.92	Gloucester	☆		☆						☆			0	0	0	
08000712	1.15	Gloucester	☆		☆						☆			0	0	0	
08000712	1.22	Gloucester	☆		☆						☆			0	0	0	
08021039	0.25	Gloucester			☆			☆			☆			0	0	0	
08021039	0.48	Gloucester			☆			☆			☆			0	0	0	
08141004	0.4	Gloucester		☆	☆						☆			0	0	0	
08141004	1.29	Gloucester		☆	☆						☆			0	0	0	
08141019	0.3	Gloucester		☆	☆						☆			0	0	0	
08161002	1.59	Gloucester		☆				☆			☆			0	0	0	
11000611	1.23	Mercer					☆	☆			☆			0	0	0	
11000611	1.81	Mercer		☆	☆						☆			0	0	0	
11000615	0.52	Mercer	☆		☆						☆			0	0	0	
11000615	0.82	Mercer		☆	☆						☆			0	0	0	
11000624	0.47	Mercer		☆	☆						☆			1	1	0	
11000629	0.99	Mercer		☆			☆				☆			3	1	0	
11000636	0.52	Mercer			☆		☆				☆			0	0	0	
11000641	0.2	Mercer						☆	☆		☆			2	2	0	
11000643	3.2	Mercer		☆	☆						☆			1	0	0	
11000647	0.77	Mercer				☆		☆			☆			0	0	0	
11000647	1.37	Mercer				☆		☆			☆			0	0	0	
11000654	0.28	Mercer							☆		☆			0	0	0	
11000654	1.62	Mercer		☆				☆			☆			4	1	0	
11000654	2.3	Mercer		☆				☆			☆			0	0	0	
11011001	0.58	Mercer			☆			☆			☆			0	0	0	
11011070	1.22	Mercer	☆				☆				☆			0	0	0	
11011146	0.36	Mercer		☆	☆						☆			1	1	0	
11011146	0.52	Mercer		☆	☆						☆			0	0	0	
11011249	0.04	Mercer	☆					☆			☆			0	0	0	
11021389	0.79	Mercer	☆					☆			☆			0	0	0	
11021389	0.8	Mercer	☆					☆			☆			0	0	0	
11021396	0.39	Mercer		☆	☆						☆			4	1	0	
11021396	0.51	Mercer		☆	☆						☆			0	0	0	
11031505	0.34	Mercer		☆	☆						☆			0	0	0	
11031505	0.54	Mercer		☆	☆						☆			0	0	0	
11031803	0.85	Mercer		☆	☆						☆			1	0	0	
11031810	1.06	Mercer		☆				☆			☆			0	0	0	
11031976	0.08	Mercer			☆		☆				☆			0	0	0	
11031978	2.38	Mercer			☆		☆				☆			0	0	0	
11031980	0.45	Mercer		☆	☆						☆			2	0	0	
11031983	0.84	Mercer		☆							☆			0	0	0	
11031996	2.6	Mercer			☆			☆			☆			0	0	0	

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present		Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
11032003	0.15	Mercer		☆	☆						☆			2.5	0	0	0
11032008	0.02	Mercer		☆	☆						☆			2.5	0	0	0
11032008	0.08	Mercer		☆	☆						☆			2.5	0	0	0
11051089	2.93	Mercer				☆		☆			☆			2.5	0	0	0
11061001	0.4	Mercer	☆								☆			2.5	0	0	0
11061002	1.25	Mercer			☆			☆			☆			2.5	0	0	0
11061002	5.82	Mercer	☆		☆						☆			2.5	0	0	0
11061002	5.9	Mercer	☆		☆						☆			2.5	0	0	0
11061010	2.43	Mercer						☆	☆		☆			2.5	0	0	0
11061010	3	Mercer			☆			☆			☆			2.5	0	0	0
11061132	0.13	Mercer			☆						☆			2.5	0	0	0
11071390	0.03	Mercer			☆				☆		☆			2.5	0	0	0
11071392	0.17	Mercer					☆				☆			2.5	0	0	0
11071392	0.4	Mercer					☆	☆			☆			2.5	0	0	0
11071392	0.47	Mercer					☆				☆			2.5	0	0	0
11071394	0.79	Mercer		☆				☆			☆			2.5	2	1	0
11071394	0.89	Mercer		☆				☆			☆			2.5	0	0	0
11072002	0.26	Mercer					☆		☆		☆			2.5	0	0	0
11072002	0.5	Mercer	☆	☆			☆				☆			2.5	0	0	0
11072002	1.35	Mercer									☆			2.5	0	0	0
11111422	0.07	Mercer		☆	☆						☆			2.5	0	0	0
11111546	0.56	Mercer		☆	☆						☆			2.5	1	1	0
11121033	1.37	Mercer	☆					☆			☆			2.5	0	0	0
11121039	1.52	Mercer						☆	☆		☆			2.5	0	0	0
11121754	1.32	Mercer		☆				☆			☆			2.5	2	1	0
11131072	0.81	Mercer		☆			☆				☆			2.5	0	0	0
11131143	1.62	Mercer						☆			☆			2.5	0	0	0
11131143	2.19	Mercer		☆			☆				☆			2.5	1	0	0
11131144	0.56	Mercer		☆	☆						☆			2.5	0	0	0
11131144	1.29	Mercer		☆	☆						☆			2.5	0	0	0
11131191	0.56	Mercer		☆	☆						☆			2.5	0	0	0
11131419	0.31	Mercer		☆	☆						☆			2.5	3	0	0
11131419	0.43	Mercer		☆	☆						☆			2.5	1	0	0
11131424	1.79	Mercer									☆			2.5	0	0	0
11131424	2.12	Mercer		☆			☆				☆			2.5	5	3	0
11131424	2.18	Mercer		☆			☆				☆			2.5	0	0	0
11131511	0.04	Mercer		☆	☆						☆			2.5	0	0	0
11141020	0.88	Mercer		☆					☆		☆			2.5	0	0	0
11141243	0.44	Mercer		☆			☆				☆			2.5	0	0	0
11142086	0.25	Mercer		☆							☆			2.5	0	0	0
11142086	0.3	Mercer		☆			☆				☆			2.5	2	0	0
11142086	0.84	Mercer			☆		☆				☆			2.5	0	0	0
11142242	0.66	Mercer		☆							☆			2.5	0	0	0
00000206	56.11	Mercer			☆		☆							2	5	2	0
00000524	3.63	Mercer			☆		☆							2	0	0	0
00000526	9.87	Mercer			☆		☆							2	1	0	0
00000530	13.32	Burlington			☆		☆							2	0	0	0
00000530	13.55	Burlington			☆		☆							2	1	0	0
00000550	7.45	Burlington			☆		☆							2	1	0	0
00000532	17.14	Burlington						☆	☆					2	0	0	0

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor				Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
00000532__	4.94	Burlington				☆		☆						2	0	0	0
00000534__	18.24	Burlington			☆			☆						2	1	1	0
00000534__	18.66	Burlington	☆					☆						2	0	0	0
00000537__	23.31	Burlington					☆	☆						2	4	1	0
00000537__	26.33	Burlington					☆	☆			☆	☆		2	2	0	0
00000537__	3.27	Camden					☆			☆				2	2	1	0
00000538__	12.61	Gloucester						☆		☆				2	1	1	1
00000538__	16.53	Gloucester				☆		☆						2	0	0	0
00000538__	6.73	Gloucester		☆				☆						2	0	0	0
00000541__	12.42	Burlington					☆							2	0	0	0
00000542__	20	Burlington		☆				☆						2	2	0	0
00000542__	9.79	Burlington				☆		☆						2	0	0	0
00000545__	7.68	Burlington		☆				☆						2	5	3	0
00000551__	21.14	Gloucester			☆		☆							2	2	2	0
00000551S	2.34	Camden		☆			☆							2	0	0	0
00000553__	35.16	Gloucester		☆				☆						2	0	0	0
00000555__	19.1	Gloucester						☆	☆					2	0	0	0
00000563__	29.46	Burlington				☆		☆						2	0	0	0
00000563__	31.21	Burlington				☆		☆						2	0	0	0
00000563__	32.27	Burlington				☆		☆						2	0	0	0
00000563__	34.48	Burlington				☆		☆						2	1	1	0
00000563__	35.65	Burlington				☆		☆						2	0	0	0
00000563__	36.17	Burlington		☆				☆						2	0	0	0
00000563__	38.45	Burlington				☆		☆						2	0	0	0
00000563__	38.63	Burlington				☆		☆						2	0	0	0
00000563__	40.63	Burlington	☆					☆						2	0	0	0
00000569__	3.6	Mercer					☆	☆						2	0	0	0
00000571__	32.01	Mercer		☆		☆								2	7	5	0
03000612__	7.82	Burlington		☆				☆						2	0	0	0
03000616__	7.75	Burlington					☆	☆						2	0	0	0
03000618__	3.57	Burlington					☆	☆						2	2	1	0
03000623__	2.61	Burlington					☆	☆						2	1	0	0
03000626__	7.96	Burlington					☆	☆						2	1	0	0
03000628__	6.27	Burlington				☆		☆						2	0	0	0
03000644__	3.63	Burlington					☆	☆						2	0	0	0
03000644__	4.8	Burlington					☆	☆						2	0	0	0
03000646__	2.65	Burlington				☆		☆						2	1	0	0
03000646__	3.73	Burlington				☆		☆						2	4	2	0
03000654__	1.71	Burlington		☆				☆						2	0	0	0
03000654__	1.95	Burlington				☆		☆						2	1	1	0
03000656__	0.92	Burlington			☆			☆	☆					2	1	0	0
03000660__	10.72	Burlington						☆						2	1	0	0
03000660__	4.19	Burlington	☆					☆						2	0	0	0
03000665__	3.14	Burlington				☆		☆						2	0	0	0
03000667__	1.31	Burlington		☆	☆			☆						2	1	0	0
03000667__	2.55	Burlington		☆				☆						2	0	0	0
03000667__	6.04	Burlington		☆	☆									2	0	0	0
03000669__	5.2	Burlington		☆							☆		☆	2	0	0	0
03000670__	11.49	Burlington				☆		☆						2	0	0	0
03000670__	3.64	Burlington		☆				☆						2	0	0	0

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present		Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
03000670__	5.76	Burlington	☆					☆						2	2	0	
03000670__	6.48	Burlington		☆				☆						2	0	0	
03000670__	8.61	Burlington		☆				☆						2	2	1	
03000672__	0.42	Burlington		☆				☆						2	1	1	
03000679__	1.75	Burlington				☆		☆						2	0	0	
03000679__	3.6	Burlington				☆		☆						2	1	0	
03000679__	8.05	Burlington				☆		☆			☆			2	0	0	
03081229__	0.11	Burlington		☆					☆		☆		☆	2	0	0	
03241001__	0.18	Burlington					☆	☆					☆	2	0	0	
03241001__	4.01	Burlington					☆	☆						2	0	0	
03241001__	4.91	Burlington						☆						2	0	0	
04000629__	1.9	Camden		☆	☆									2	1	1	
04000635__	0.55	Camden			☆		☆							2	1	0	
04000650__	0.1	Camden		☆	☆									2	0	0	
04000667__	0.59	Camden					☆		☆					2	0	0	
04000667__	0.87	Camden		☆			☆							2	0	0	
04000673__	0.16	Camden	☆				☆							2	0	0	
04000677__	0.24	Camden			☆				☆					2	1	0	
04000683__	4.02	Camden			☆		☆							2	0	0	
04000687__	0.9	Camden		☆			☆							2	0	0	
04000706__	6.62	Camden					☆	☆						2	0	0	
04000722__	1.88	Camden	☆					☆						2	0	0	
08000620__	2.79	Gloucester			☆			☆						2	1	0	
08000626__	1.83	Gloucester				☆		☆						2	1	1	
08000627__	0.84	Gloucester		☆				☆						2	0	0	
08000641__	1.76	Gloucester	☆					☆						2	1	0	
08000655__	1.92	Gloucester					☆	☆						2	1	1	
08000667__	11.63	Gloucester		☆				☆						2	0	0	
08000667__	13.79	Gloucester					☆	☆						2	0	0	
08000667__	7.8	Gloucester						☆	☆					2	0	0	
08101053__	0.81	Gloucester					☆	☆						2	0	0	
11000623__	1.28	Mercer		☆				☆						2	0	0	
11000632__	0.26	Mercer				☆	☆							2	0	0	
11000643__	3.57	Mercer			☆									2	0	0	
11021396__	0.44	Mercer		☆	☆									2	0	0	
11031990__	0.75	Mercer			☆		☆							2	0	0	
11032063__	0.06	Mercer			☆						☆	☆		2	0	0	
11032261__	0.29	Mercer		☆	☆									2	0	0	
11041056__	0.57	Mercer			☆						☆		☆	2	0	0	
11041056__	0.93	Mercer						☆			☆		☆	2	0	0	
11061001__	0.11	Mercer		☆				☆						2	0	0	
11061002__	0.32	Mercer			☆									2	0	0	
11061213__	0.13	Mercer						☆					☆	2	0	0	
11071174__	2.63	Mercer						☆					☆	2	0	0	
11131141__	1.42	Mercer		☆				☆						2	1	0	
11131424__	0.21	Mercer			☆		☆							2	0	0	
11141020__	1.02	Mercer		☆										2	1	0	
11142030__	1.33	Mercer						☆						2	0	0	
00000528__	7.55	Burlington						☆			☆			1.5	0	0	
00000532__	11.59	Burlington						☆			☆			1.5	0	0	

DVRPC Curves
Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor				Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present	Total Lane Departure (KABCO)		Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)	
00000533__	10.72	Mercer	☆								☆			0	0	0		
00000533__		Mercer									☆			7	0	0		
00000533__	9.32	Mercer						☆			☆			0	0	0		
00000533__	9.61	Mercer						☆			☆			0	0	0		
00000533__	9.74	Mercer						☆			☆			0	0	0		
00000533__	9.98	Mercer						☆			☆			0	0	0		
00000538__	16.86	Gloucester						☆			☆			0	0	0		
00000539__	47.21	Mercer						☆			☆			1	1	0		
00000542__	16.27	Burlington						☆			☆			0	0	0		
00000542__	19.67	Burlington						☆			☆			0	0	0		
00000543__	25.68	Burlington						☆			☆			0	0	0		
00000543__	27.4	Burlington						☆			☆			0	0	0		
00000563__	42.99	Burlington						☆			☆			1	1	0		
00000571__	31.5	Mercer		☆							☆			0	0	0		
00000571__	32.84	Mercer					☆				☆			0	0	0		
00000579__	9.13	Mercer					☆				☆			1	1	0		
03000612__	0.17	Burlington			☆						☆			2	0	0		
03000612__	7.93	Burlington						☆			☆			0	0	0		
03000612__	8.66	Burlington						☆			☆			1	0	0		
03000612__	8.72	Burlington						☆			☆			0	0	0		
03000616__	20.25	Burlington						☆			☆			0	0	0		
03000620__	11.73	Burlington						☆			☆			0	0	0		
03000624__	0.05	Burlington			☆						☆			0	0	0		
03000628__	5.89	Burlington						☆			☆			1	1	0		
03000636__	7.96	Burlington						☆			☆			1	0	0		
03000641__	7.27	Burlington		☆							☆			0	0	0		
03000641__	7.45	Burlington		☆							☆			1	1	0		
03000641__	7.92	Burlington			☆						☆			0	0	0		
03000641__	8.71	Burlington			☆						☆			1	0	0		
03000645__	1.55	Burlington						☆			☆			0	0	0		
03000645__	3.48	Burlington						☆			☆			0	0	0		
03000645__	4.05	Burlington						☆			☆			0	0	0		
03000645__	3.81	Burlington		☆							☆			6	4	0		
03000648__	1.94	Burlington						☆			☆			0	0	0		
03000652__	0.79	Burlington		☆							☆			0	0	0		
03000654__	2.23	Burlington						☆			☆			0	0	0		
03000660__	1.88	Burlington						☆			☆			0	0	0		
03000660__	13.25	Burlington			☆						☆			2	0	0		
03000660__	2.34	Burlington						☆			☆			0	0	0		
03000660__	2.54	Burlington						☆			☆			1	1	0		
03000660__	5.04	Burlington						☆			☆			0	0	0		
03000660__	5.16	Burlington									☆			0	0	0		
03000660__	5.57	Burlington						☆			☆			0	0	0		
03000660__	8.87	Burlington						☆			☆			0	0	0		
03000660__	9.38	Burlington						☆			☆			0	0	0		
03000667__	0.77	Burlington			☆						☆			0	0	0		
03000667__	4	Burlington						☆			☆			0	0	0		
03000669__	6.15	Burlington						☆			☆			0	0	0		
03000670__	4.83	Burlington						☆			☆			0	0	0		
03000670__	7.75	Burlington						☆			☆			0	0	0		

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present		Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
03000683__	0.38	Burlington		☆							☆			1.5	0	0	0
03121087__	0.47	Burlington					☆				☆			1.5	0	0	0
03131136__	0.03	Burlington		☆							☆			1.5	1	0	0
03131136__	0.15	Burlington		☆							☆			1.5	1	1	0
03131268__	0.59	Burlington							☆		☆			1.5	3	0	0
03131268__	2.1	Burlington		☆							☆			1.5	1	0	0
03131740__	0.4	Burlington		☆							☆			1.5	0	0	0
03151119__	0.31	Burlington		☆							☆			1.5	0	0	0
03151119__	0.36	Burlington		☆							☆			1.5	1	0	0
03191233__	0.1	Burlington		☆							☆			1.5	1	0	0
03191233__	0.79	Burlington		☆							☆			1.5	1	0	0
03191233__	2.52	Burlington					☆				☆			1.5	0	0	0
03221079__	0.75	Burlington							☆		☆			1.5	1	0	0
03241001__	0.92	Burlington		☆							☆			1.5	0	0	0
03241031__	3.06	Burlington						☆			☆			1.5	0	0	0
03291116__	0.61	Burlington			☆						☆			1.5	0	0	0
03291116__	0.72	Burlington			☆						☆			1.5	0	0	0
03331020__	0.1	Burlington									☆			1.5	2	1	0
03331020__	1.53	Burlington						☆			☆			1.5	0	0	0
03331043__	0.48	Burlington						☆			☆			1.5	0	0	0
03331043__	1.92	Burlington						☆			☆		☆	1.5	1	0	0
03331043__	2.69	Burlington		☆							☆			1.5	3	1	0
04000628__	0.16	Camden							☆		☆			1.5	0	0	0
040006282_X100040	0.02	Camden		☆							☆			1.5	0	0	0
04000630__	0.25	Camden			☆						☆			1.5	0	0	0
04000646__	0.7	Camden			☆						☆			1.5	0	0	0
04000660__	0.3	Camden			☆						☆			1.5	0	0	0
04000660__	0.28	Camden			☆						☆			1.5	0	0	0
04000660__	0.51	Camden			☆						☆			1.5	0	0	0
04000675__	6.05	Camden					☆				☆			1.5	1	0	0
04000690__	0.6	Camden		☆							☆			1.5	0	0	0
04000690__	0.77	Camden		☆							☆			1.5	0	0	0
04000690__	0.89	Camden		☆							☆			1.5	0	0	0
04000690__	0.98	Camden		☆							☆			1.5	0	0	0
04000696__	0.52	Camden		☆							☆			1.5	0	0	0
04000698__	0.34	Camden							☆		☆			1.5	0	0	0
04000698__	0.65	Camden		☆							☆			1.5	0	0	0
040007081__	0.07	Camden	☆								☆			1.5	0	0	0
04000716__	0.04	Camden	☆								☆			1.5	0	0	0
04000718__	1.29	Camden						☆			☆			1.5	0	0	0
04000720__	6.46	Camden		☆							☆			1.5	0	0	0
04000723__	2.67	Camden						☆			☆			1.5	1	0	0
04000727__	2.12	Camden		☆							☆			1.5	0	0	0
04000727__	2.12	Camden		☆							☆			1.5	0	0	0
04000727__	2.19	Camden		☆							☆			1.5	1	1	0
04000727__	2.2	Camden		☆							☆			1.5	0	0	0
04000727__	2.56	Camden		☆							☆			1.5	0	0	0
040007572__	0.79	Camden		☆							☆			1.5	0	0	0
04061092__	0.26	Camden							☆		☆			1.5	0	0	0
04061092__	0.36	Camden		☆							☆			1.5	0	0	0

Risk Factor Scoring Table

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Risk Factor Scoring Table

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor							Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mill Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6% 8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes		Visual Trap Present	Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)
11011072__	0.49	Mercer						☆			☆			0	0	0
11031505__	0.65	Mercer			☆						☆			0	0	0
11031803__	0.82	Mercer			☆						☆			0	0	0
11031974__	0.18	Mercer			☆						☆			1	0	0
11031985__	1.1	Mercer			☆						☆			1	0	0
11031996__	2.01	Mercer						☆			☆			0	0	0
11031997__	2.01	Mercer							☆		☆			0	0	0
11032003__	0.03	Mercer			☆						☆			0	0	0
11041056__	0.16	Mercer			☆						☆			0	0	0
11041056__	0.49	Mercer			☆						☆			0	0	0
11041056__	1.42	Mercer									☆			0	0	0
11041057__	0.81	Mercer						☆			☆			0	0	0
11061001__	0.43	Mercer						☆			☆			0	0	0
11061001__	0.57	Mercer									☆			0	0	0
11061002__	1.72	Mercer						☆			☆			0	0	0
11061002__	1.92	Mercer						☆			☆			0	0	0
11061002__	2.07	Mercer						☆			☆			1	1	0
11061002__	3.59	Mercer	☆								☆			0	0	0
11061002__	3.72	Mercer	☆								☆			0	0	0
11061010__	0.52	Mercer							☆		☆			0	0	0
11061010__	1.33	Mercer		☆							☆			0	0	0
11061010__	2.65	Mercer						☆			☆			0	0	0
11061010__	3.5	Mercer						☆			☆			0	0	0
11061010__	3.61	Mercer						☆			☆			0	0	0
11061010__	3.93	Mercer						☆			☆			1	1	0
11061213__	0.62	Mercer						☆			☆			0	0	0
11061213__	0.64	Mercer						☆			☆			0	0	0
11061399__	0.11	Mercer			☆						☆			0	0	0
11071158__	0.5	Mercer							☆		☆			0	0	0
11071158__	1.07	Mercer		☆							☆			0	0	0
11071174__	2.58	Mercer						☆			☆			0	0	0
11072002__	0.38	Mercer					☆				☆			1	0	0
11072002__	1.16	Mercer					☆				☆			0	0	0
11072002__	1.42	Mercer					☆				☆			0	0	0
11121043__	0.88	Mercer							☆		☆			0	0	0
11121137__	0.31	Mercer	☆								☆			0	0	0
11121137__	0.45	Mercer	☆								☆			0	0	0
11121137__	0.82	Mercer							☆		☆			0	0	0
11121137__	1.15	Mercer				☆					☆			1	0	0
11131041__	1.41	Mercer					☆				☆			2	0	0
11131071__	0.04	Mercer	☆								☆			0	0	0
11131144__	0.66	Mercer			☆						☆			0	0	0
11131144__	1.04	Mercer			☆						☆			0	0	0
11131191__	0.5	Mercer			☆						☆			0	0	0
11131424__	1.9	Mercer		☆							☆			0	0	0
11141018__	0.46	Mercer									☆			0	0	0
11141018__	0.59	Mercer		☆							☆			0	0	0
11141018__	1.66	Mercer					☆				☆			0	0	0
11141020__	0.39	Mercer		☆							☆			0	0	0
11141020__	0.98	Mercer							☆		☆			0	0	0

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor				Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present	Total Lane Departure (KABCO)		Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)	
11141020__	1.2	Mercer		☆							☆			1.5	0	0	0	
11141117__	0.23	Mercer							☆		☆			1.5	0	0	0	
11141117__	1.08	Mercer							☆					1.5	0	0	0	
11141023__	0.19	Mercer		☆							☆			1.5	1	0	0	
11142240__	2.01	Mercer							☆					1.5	0	0	0	
00000518__	4.76	Mercer						☆						1	0	0	0	
00000528__	3.87	Burlington						☆						1	0	0	0	
00000528__	6.23	Burlington												1	0	0	0	
00000532__	8.05	Burlington						☆						1	0	0	0	
00000532__	9.6	Burlington						☆						1	0	0	0	
00000533__	9.86	Mercer						☆						1	0	0	0	
00000538__	9.44	Gloucester						☆						1	0	0	0	
00000539__	45.83	Mercer						☆						1	0	0	0	
00000539__	47.8	Mercer						☆						1	1	1	0	
00000539__	48.41	Mercer						☆						1	0	0	0	
00000539__	48.59	Mercer						☆						1	1	0	0	
00000539__	48.92	Mercer						☆						1	0	0	0	
00000539__	49.18	Mercer						☆						1	0	0	0	
00000542__	10.61	Burlington						☆						1	0	0	0	
00000542__	17.26	Burlington						☆						1	0	0	0	
00000542__	17.98	Burlington						☆						1	0	0	0	
00000542__	19.08	Burlington						☆						1	0	0	0	
00000542__	19.53	Burlington						☆						1	0	0	0	
00000542__	20.27	Burlington						☆						1	0	0	0	
00000543__	26.32	Burlington						☆						1	0	0	0	
00000543__	26.93	Burlington						☆						1	0	0	0	
00000563__	25.81	Burlington						☆						1	0	0	0	
00000563__	26.36	Burlington						☆						1	0	0	0	
00000563__	29.14	Burlington						☆						1	0	0	0	
00000563__	32.62	Burlington						☆						1	0	0	0	
00000563__	33.42	Burlington						☆						1	0	0	0	
00000563__	35.33	Burlington						☆						1	0	0	0	
00000563__	36.95	Burlington						☆						1	0	0	0	
00000563__	37.79	Burlington						☆						1	0	0	0	
00000563__	40.69	Burlington						☆						1	0	0	0	
00000571__	33.02	Mercer					☆							1	0	0	0	
03000603__	1.21	Burlington					☆							1	0	0	0	
03000612__	8.35	Burlington						☆						1	0	0	0	
03000616__	13.85	Burlington						☆						1	0	0	0	
03000628__	4.88	Burlington						☆						1	0	0	0	
03000630__	15.13	Burlington		☆										1	2	0	0	
03000630__	15.45	Burlington						☆						1	0	0	0	
03000652__	0.49	Burlington									☆		☆	1	0	0	0	
03000654__	1.48	Burlington						☆						1	1	0	0	
03000654__	1.61	Burlington						☆						1	0	0	0	
03000660__	1.77	Burlington						☆						1	0	0	0	
03000660__	10.27	Burlington						☆						1	0	0	0	
03000660__	2.13	Burlington						☆						1	0	0	0	
03000660__	2.2	Burlington						☆						1	0	0	0	
03000660__	2.91	Burlington						☆						1	0	0	0	

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present		Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
03000660	9.19	Burlington						☆						1	0	0	0
03000665	2.87	Burlington						☆						1	0	0	0
03000665	3.05	Burlington						☆						1	0	0	0
03000665	3.71	Burlington						☆						1	0	0	0
03000666	1.09	Burlington						☆						1	1	0	0
03000667	2.21	Burlington							☆					1	0	0	0
03000667	3	Burlington						☆						1	0	0	0
03000670	3.01	Burlington						☆						1	0	0	0
03000670	4.28	Burlington						☆						1	0	0	0
03000670	5.85	Burlington						☆						1	2	0	0
03000670	8.71	Burlington						☆						1	0	0	0
03000672	1.25	Burlington			☆									1	0	0	0
03000679	0.76	Burlington						☆						1	0	0	0
03000679	0.77	Burlington						☆						1	0	0	0
03000679	2.84	Burlington						☆						1	0	0	0
03000679	3.78	Burlington						☆						1	0	0	0
03000679	5.75	Burlington						☆						1	0	0	0
03000679	5.88	Burlington						☆						1	0	0	0
03000679	6.84	Burlington						☆						1	0	0	0
03061019	0.24	Burlington					☆							1	0	0	0
03241031	3.52	Burlington						☆					☆	1	0	0	0
03331020	0.07	Burlington									☆			1	0	0	0
04000660	0.4	Camden			☆									1	0	0	0
04000667	0.62	Camden					☆							1	0	0	0
04000685	1.75	Camden						☆						1	0	0	0
04000687	2.56	Camden		☆										1	0	0	0
04000704	0.17	Camden		☆										1	1	0	0
04000727	0.57	Camden		☆										1	0	0	0
08000607	1.92	Gloucester						☆						1	0	0	0
08000607	3.41	Gloucester						☆						1	0	0	0
08000609	2.34	Gloucester						☆						1	0	0	0
08000626	0.8	Gloucester						☆						1	0	0	0
08000653	0.31	Gloucester			☆									1	20	7	0
08000653	3.7	Gloucester						☆						1	0	0	0
08000662	2.83	Gloucester			☆									1	0	0	0
08000664	2.76	Gloucester						☆						1	0	0	0
08000667	10.05	Gloucester						☆						1	0	0	0
08000667	10.15	Gloucester						☆						1	0	0	0
08000667	12.14	Gloucester						☆						1	0	0	0
08000667	13.5	Gloucester					☆							1	0	0	0
08000667	9.76	Gloucester						☆						1	0	0	0
11000605	0.76	Mercer		☆										1	0	0	0
11000615	1.74	Mercer						☆						1	0	0	0
11000623	1.48	Mercer						☆						1	0	0	0
11000623	2.66	Mercer			☆									1	0	0	0
11000625	1.79	Mercer						☆						1	0	0	0
11021036	0.19	Mercer			☆									1	0	0	0
11031985	1.46	Mercer			☆									1	0	0	0
11041056	0.94	Mercer						☆						1	1	0	0
11041056	1.3	Mercer						☆						1	0	0	0

DVRPC Curves

Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor								Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes	Visual Trap Present		Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)	Fatal and Severe Injury Lane Departure (KA)
11061002__	5.78	Mercer			☆		☆							1	0	0	0
11061004__	0.97	Mercer												1	0	0	0
11061010__	0.89	Mercer									☆		☆	1	0	0	0
11141018__	0.68	Mercer		☆										1	1	0	0
11141018__	1.16	Mercer							☆					1	0	0	0
03000616__	13.53	Burlington									☆			0.5	1	0	0
03000652__	0.28	Burlington									☆			0.5	0	0	0
03000652__	0.31	Burlington									☆			0.5	0	0	0
03000652__	0.77	Burlington									☆			0.5	0	0	0
03000672__	1.71	Burlington									☆			0.5	0	0	0
03000681__	1.27	Burlington									☆			0.5	1	0	0
03011032__	0.55	Burlington									☆			0.5	0	0	0
03071025__	0.34	Burlington									☆			0.5	0	0	0
03071025__	0.4	Burlington									☆			0.5	0	0	0
03071025__	0.49	Burlington									☆			0.5	0	0	0
03081229__	0.05	Burlington									☆			0.5	1	0	0
03081232__	0.21	Burlington									☆			0.5	0	0	0
03131030__	0.51	Burlington									☆			0.5	0	0	0
03131136__	0.55	Burlington									☆			0.5	0	0	0
03141015__	0.14	Burlington									☆			0.5	0	0	0
03221079__	0.37	Burlington									☆			0.5	0	0	0
03221079__	0.58	Burlington									☆			0.5	1	1	0
03241061__	0.55	Burlington									☆			0.5	2	0	0
03241061__	0.95	Burlington									☆			0.5	0	0	0
03241276__	0.79	Burlington									☆			0.5	0	0	0
03241276__	0.94	Burlington									☆			0.5	0	0	0
03291153__	0.41	Burlington									☆			0.5	0	0	0
04000628__	0.17	Camden									☆			0.5	0	0	0
04000687__	2.13	Camden									☆			0.5	0	0	0
04000690__	0.1	Camden									☆			0.5	0	0	0
04000690__	0.11	Camden									☆			0.5	0	0	0
04000690__	0.21	Camden									☆			0.5	1	0	0
04000690__	0.35	Camden									☆			0.5	0	0	0
04000690__	0.71	Camden									☆			0.5	0	0	0
04000698__	0.36	Camden									☆			0.5	0	0	0
04000698__	0.4	Camden									☆			0.5	0	0	0
04000698__	0.54	Camden									☆			0.5	0	0	0
04000704__	0.03	Camden									☆			0.5	0	0	0
04000726__	0.64	Camden									☆			0.5	0	0	0
04000727__	0.23	Camden									☆			0.5	0	0	0
04031091__	0	Camden									☆			0.5	0	0	0
04091991__	0.03	Camden									☆			0.5	0	0	0
08000607__	0.86	Gloucester									☆			0.5	0	0	0
08000607__	1.25	Gloucester									☆			0.5	0	0	0
08000607__	6.02	Gloucester									☆			0.5	0	0	0
08201198__	0.77	Gloucester									☆			0.5	0	0	0
11000600__	0.46	Mercer									☆			0.5	0	0	0
11000600__	1.43	Mercer									☆			0.5	0	0	0
11000672__	0.42	Mercer									☆			0.5	0	0	0
11031974__	0.53	Mercer									☆			0.5	0	0	0

DVRPC Curves
Risk Factor Scoring Table

DVRPC Curve			Primary Risk Factor							Secondary Risk Factor			Total Risk Score	Crash History (# of Crashes)		
State Route Identifier	Mile Post Begin	County	No Guide Rail, Edge Risk of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length 500-800 Feet	Arterial	Posted Speed 40 MPH and Greater	Super-elevation 6%-8%	Presence of KA Crash	Radius 200-500 Feet	Four Lanes		Visual Trap Present	Total Lane Departure (KABCO)	Injury Lane Departure (KABCO)
11031974__	0.61	Mercer									☆			0	0	0
11031997__	1.39	Mercer									☆			0	0	0
11031997__	1.6	Mercer									☆			0	0	0
11031997__	1.68	Mercer									☆			0	0	0
11061002__	3.71	Mercer									☆			0	0	0
11061002__	3.96	Mercer									☆			0	0	0
11061002__	3.97	Mercer									☆			0	0	0
11061010__	0.15	Mercer									☆			0	0	0
11061010__	0.21	Mercer									☆			0	0	0
11061010__	0.32	Mercer									☆			0	0	0
11061010__	0.58	Mercer									☆			0	0	0
11061010__	0.74	Mercer									☆			0	0	0
11061010__	1.01	Mercer									☆			0	0	0
11061010__	1.24	Mercer									☆			0	0	0
11061010__	1.37	Mercer									☆			0	0	0
11061399__	1.13	Mercer									☆			0	0	0
11071158__	0.31	Mercer									☆			0	0	0
11071158__	0.68	Mercer									☆			0	0	0
11072001__	0.33	Mercer									☆			0	0	0
11072001__	1.24	Mercer									☆			4	0	0
11121033__	0.06	Mercer									☆			0	0	0
11121033__	0.77	Mercer									☆			0	0	0
11121043__	0.67	Mercer									☆			0	0	0
11121043__	1.61	Mercer									☆			0	0	0
11131072__	0.43	Mercer									☆			0	0	0
11131073__	0.26	Mercer									☆			0	0	0
11141018__	0.19	Mercer									☆			0	0	0
11141018__	0.98	Mercer									☆			0	0	0
11141018__	1.21	Mercer									☆			0	0	0
11141020__	0.11	Mercer									☆			0	0	0
11141020__	0.34	Mercer									☆			0	0	0
11141020__	0.52	Mercer									☆			0	0	0
03000646__	0.15	Burlington												7	2	0
03000669__	4.87	Burlington												0	0	0
03000672__	1.35	Burlington												0	0	0
04000696__	0.62	Camden												0	0	0
04000711__	0.43	Camden												1	0	0
08000607__	1.14	Gloucester												0	0	0
08000648__	0.36	Gloucester												0	0	0
11061002__	4.36	Mercer												0	0	0
11061399__	1.05	Mercer												0	0	0
11131072__	0.35	Mercer												0	0	0
11141020__	0.25	Mercer												0	0	0

SJTPO Region, County and Municipal Routes

Horizontal Curve Risk Factor Analysis and Identification

PREPARED FOR: NJDOT
COPY TO: File
DATE: September 27, 2019
REVISION NO.: Original

1. Introduction

1.1 The Systemic Analysis Process

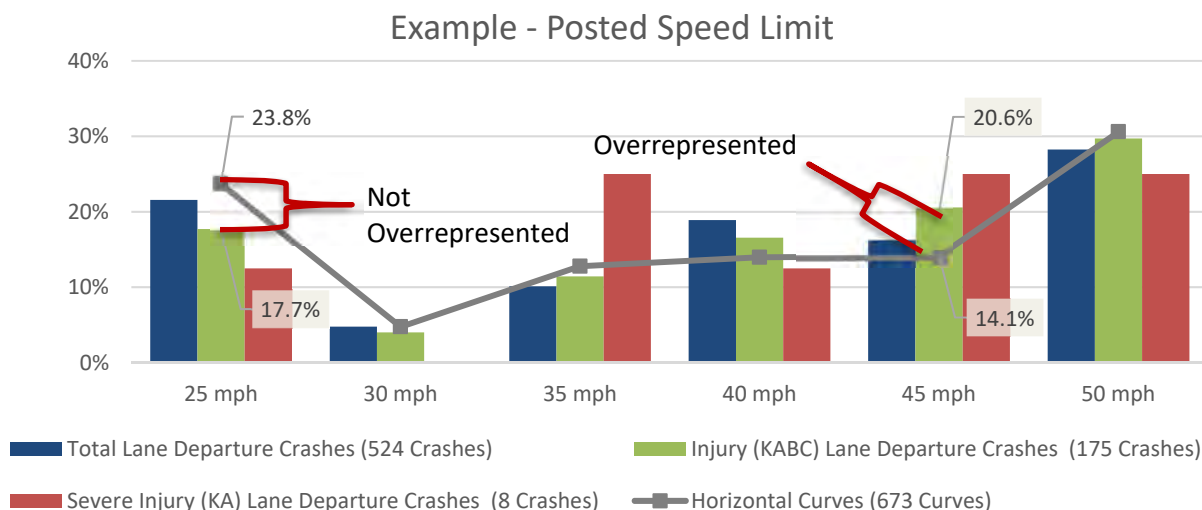
The systemic approach involves evaluating the crash history for focus crash types occurring across a roadway system. Risk factors are identified by documenting common roadway characteristics at sites where focus crashes have occurred. Once risk factors are identified, all sites within the system are scored for the number of risk factors present. All sites are prioritized based on risk score, with higher risk scores indicating locations where crashes are more likely to occur. Finally, countermeasures targeted at addressing the focus crash type are identified for the system, with implementation generally based on a combination of priority ranking and optimization of benefits considering budget and other factors. This memo focuses on the identification of risk factors for roadway/lane departure crashes occurring on horizontal curves on the County and Municipal Routes in the South Jersey Transportation Planning Organization (SJTPO) jurisdiction. Subsequent steps including network screening, diagnosis and selection of countermeasure, and program development and implementation will be addressed in later documents.

The location and geometry of the horizontal curves on the SJTPO local system was identified from data collected through the Curve Advisory Reporting Service (CARS), the NJDOT Straight Line Diagrams (SLD) database, and through additional manual data collection. Potential risk factors at horizontal curves on County and Municipal routes in the SJTPO region were identified by comparing the proportion of injury crashes associated with a specific roadway feature to the proportions of curves with this feature. Injury crashes include K, A, B, and C severity crashes based on the National Safety Council's KABCO scale as defined in the following table.

Crash Severity Code	Highest Injury Sustained in Crash
K	Killed
A	Incapacitating Injury
B	Non-incapacitating Injury
C	Possible Injury
O	No Injury (Property Damage Only)

Source: <https://safety.fhwa.dot.gov/hsip/resources/fhwasa09029/sec4.cfm>

Roadway feature data, collected and documented in other tasks, describe the infrastructure and operation for each curve. The presence, or absence, of a roadway feature was classified as a risk factor when the proportion of total injury crashes related to a specific feature exceeded the proportion of curves. The degree of overrepresentation was defined as the difference between the portion of fatal and injury crashes compared to the proportion of curve inventory. Consider the following figure as an example.



Charts like this one help to initially visualize overrepresentation of risk factors across the analysis network. In the above chart, the green vertical bars represent the proportion of lane departure injury crashes occurring on curves with specific posted speed limits along the x-axis. The solid grey line represents the proportion of curves within each speed limit group.

When the green bar is above the grey line a roadway feature is considered overrepresented. When the green bar is below the grey line, a feature is not considered overrepresented. The degree of overrepresentation is determined as the difference between the green bar (proportion of lane departure injury crashes) and the grey line (proportion of curves). In the above example, curves with a speed limit of 45 MPH represent 20.6% of fatal and injury crashes for curves and only 14.1% of the regional curve inventory. What this means is that a higher than average number of fatal and severe injury crashes at the curves with a speed limit of 45 MPH would be expected considering the proportion of total curves (as compared to the rest of the system) that the curves represent. The feature 'Speed Limit 45 MPH' is overrepresented by 6.5% (the difference between the percent of fatal and injury crashes and the proportion of the curve inventory). Further, curves with a posted speed limit of 40 MPH are also overrepresented for fatal and injury crashes. Following a similar process for speed limits of 45 MPH, the feature is overrepresented by 2.6%.

For the analysis documented within this memo, the study curves are the curves within the SJTPO region occurring on County and Municipal routes as identified by the CARS analysis. The referenced crashes are the lane departure crashes occurring on the identified study curves. Each curve in this regional network will be assigned a risk score based on the number of primary and secondary risk factors (as defined in this memo) present at the curve. One point will be added to the risk score for each primary risk factor present along the curve and one-half point for each secondary risk factor. Separate analyses were conducted for the SJTPO and Delaware Valley

Regional Planning Commission (DVRPC) regions to ensure appropriate risk factors are identified for each region. While both analyses are presented in uniform memos, not all figures or recommendations will match between the two regions. Certain attributes require different groupings or bin sizes to determine any overrepresentation within the region.

1.2 Risk Factors

Roadway features are determined to be risk factors based on the degree of overrepresentation of the crashes associated with that feature across the network based on the following criteria:

- Primary risk factors exhibit overrepresentation of 5% or more across the analysis network.
- Secondary risk factors exhibit overrepresentation greater than or equal to 1% but less than 5% across the analysis network.
- Potential risk factors that were analyzed but found to exhibit overrepresentation of less than 1% are not recommended as risk factors.

Continuing with the previous example, the overrepresentation of fatal and injury crashes on curves with posted speed limits of 40 MPH or 45 MPH is 9.1%, which makes it a primary risk factor.

An important benefit of the systemic analysis is that while an individual site may not show an overrepresentation, if the risk factor is present at the site it will still be scored; the presence of the risk factor indicates there is a greater potential for a crash to occur compared to sites without the risk factor present. This method of analyzing risk for fatal and injury crashes uses the risk factors linked to crashes as the means to rank and prioritize locations, irrespective of whether a crash has occurred at the site. This is particularly important for rural and lower classification routes where volumes and associated crash frequency are relatively low.

Roadway/ lane departure crash data were collected for the 673 identified curves within the SJTPO region for the period of 2012-2016. Crash data was obtained from two sources:

- New Jersey Department of Transportation (NJDOT) Bureau of Transportation Data and Safety (BTDS). *2012-2016 Raw Crash Data and Master File Layout*. Accessed 10 April 2018. <http://www.gpiprojects.com/HSIP>
- NJDOT BTDS. *Safety Voyager Geodatabase 2012-2016*. Personal Communication [fileshare.gpinet.com] with CH2M HILL. 19 April 2018.

A total of 524 lane departure crashes (183 Injury and 341 property damage only) were identified from this data set as having occurred within the limits of the 673 curves.

The following table contains a summary of the recommended primary and secondary risk factors.

Primary Risk Factors – 1 point <i>(full risk point weighting)</i>
Adjacent intersection present (internal or within 50 feet)
Curve length greater than or equal to 500 feet and less than 800 feet
Lane width - 12 feet and greater with a curve radius of 1,000 feet or less
Posted speed limit - 40 or 45 MPH
Shoulder width greater than 5.5 feet with edge risk rating of 2C
Superelevation greater than or equal to 3% and less than 4%
Presence of fatal or severe injury crash
Secondary Risk Factors – ½ point <i>(half-point risk weighting)</i>
Area Type - Urban
Functional classification - Other Principal Arterials
Median present
Shoulder width greater than 5.5 feet with edge risk rating of 1

Factors assessed for safety but determined not to be risk factors include:

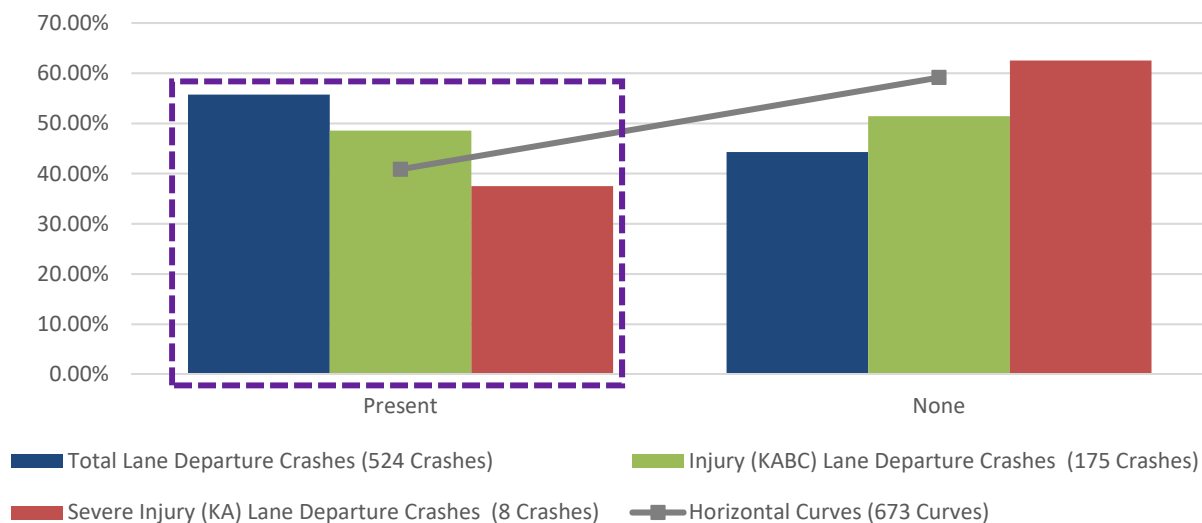
- Curve delineation
- Guide rail
- Highway lighting
- Horizontal curve warning sign(s) present
- Number of lanes
- Shoulder type
- Sidewalk
- Visual trap

Additional analysis for each recommended risk factor is presented in Sections 2 and 3 of this document. Section 4 of this document contains additional analysis of each factor analyzed but not recommended as a risk factor.

2 Primary Risk Factors

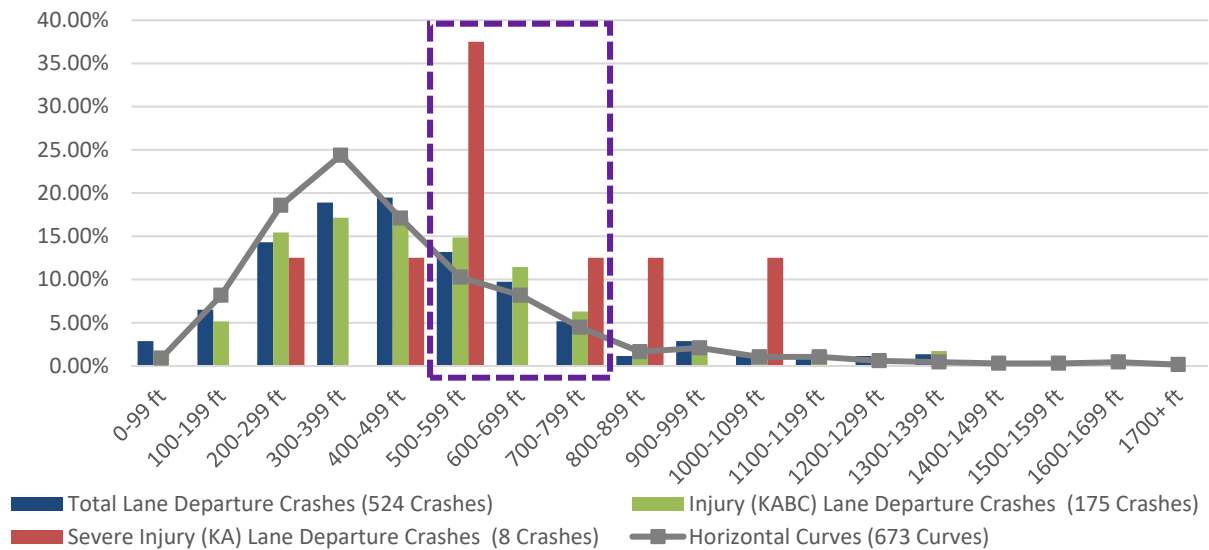
The following six roadway factors were identified as primary risk factors through an evaluation of overrepresentation of injury crashes. In the following charts, a roadway feature is considered overrepresented when the green bar is above the grey line. When the green bar is below the grey line a factor is not considered overrepresented. The degree of overrepresentation is determined as the difference between the green bar (proportion of injury crashes) and the grey line (proportion of curves). Primary risk factors are those where the degree of overrepresentation is 5% or greater. The following primary risk factors are presented in alphabetical order. There is no recommended prioritization of these factors based on degree of overrepresentation or other considerations.

2.1 Adjacent Intersection



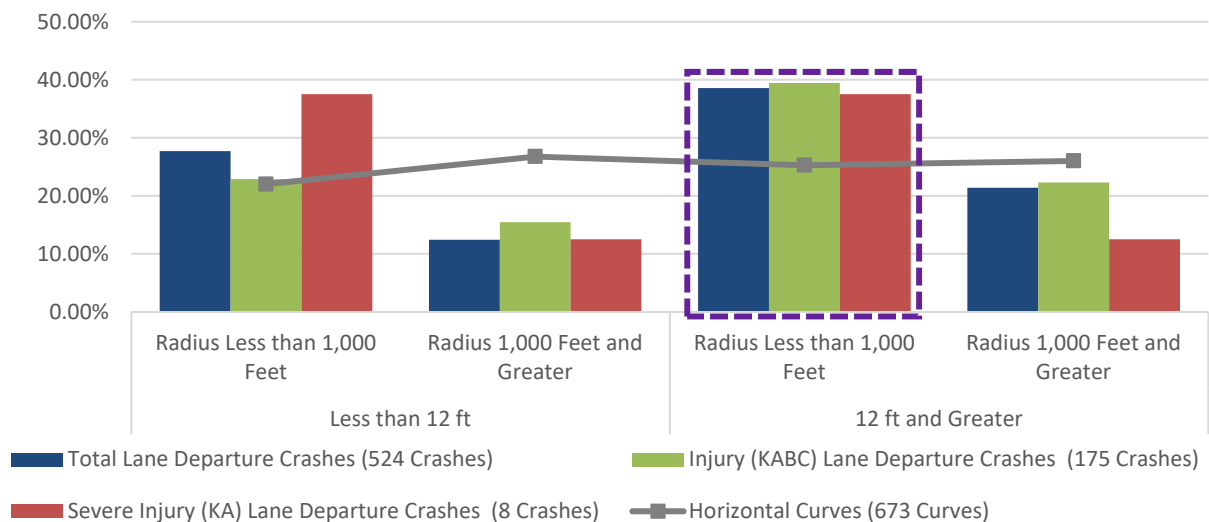
Adjacent intersection includes any curve with an intersection roadway anywhere along or within 50 feet of the beginning or end points of the curve. Curves with adjacent intersections are overrepresented by 7.7%, as identified in the above figure. **As such, presence of adjacent intersections (internal or within 50 feet) are considered a primary risk factor.**

2.2 Curve Length



Curve length refers to the total length of the given curve. Among study curves, 22.9% have a curve length of between 500 feet and 800 feet. Based on the above figure, **curves with a length greater than or equal to 500 feet and less than 800 feet are recommended as a primary risk factor.**

2.3 Lane Width and Curve Radius

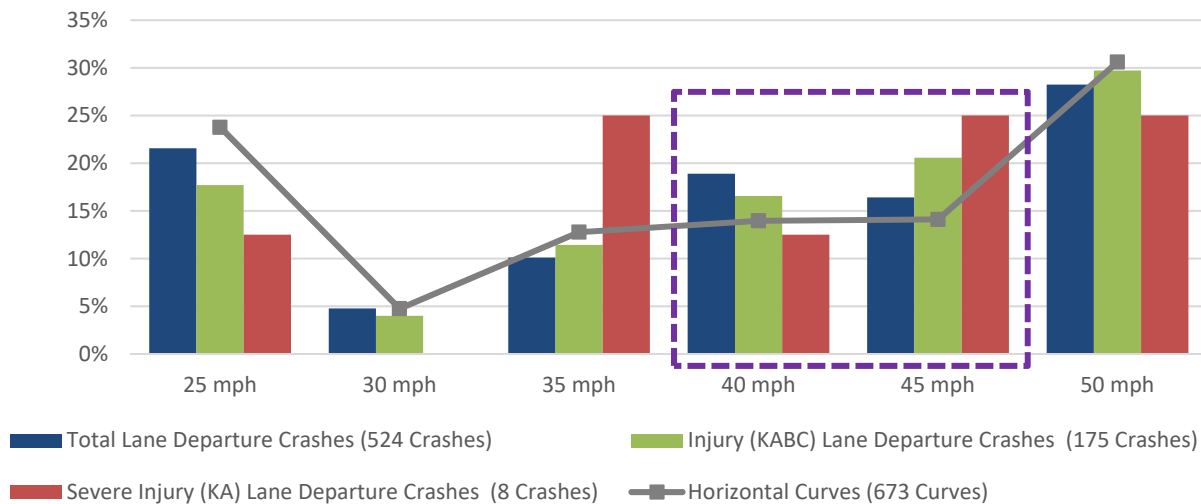


Initial investigation of lane width indicated that curves with lanes that are 12-foot wide or greater are overrepresented. However, 12-foot lanes are generally accepted as the base condition for safety. The perceived overrepresentation of the safer condition warrants further investigation to try to explain if there are additional factors or a combination of factors that better represent risk across the network. Several combinations of risk factors were developed to better understand the risk associated with 12-foot wide lanes including:

- Area type
- Posted speed limit
- Functional classification
- Superelevation
- Curve radius

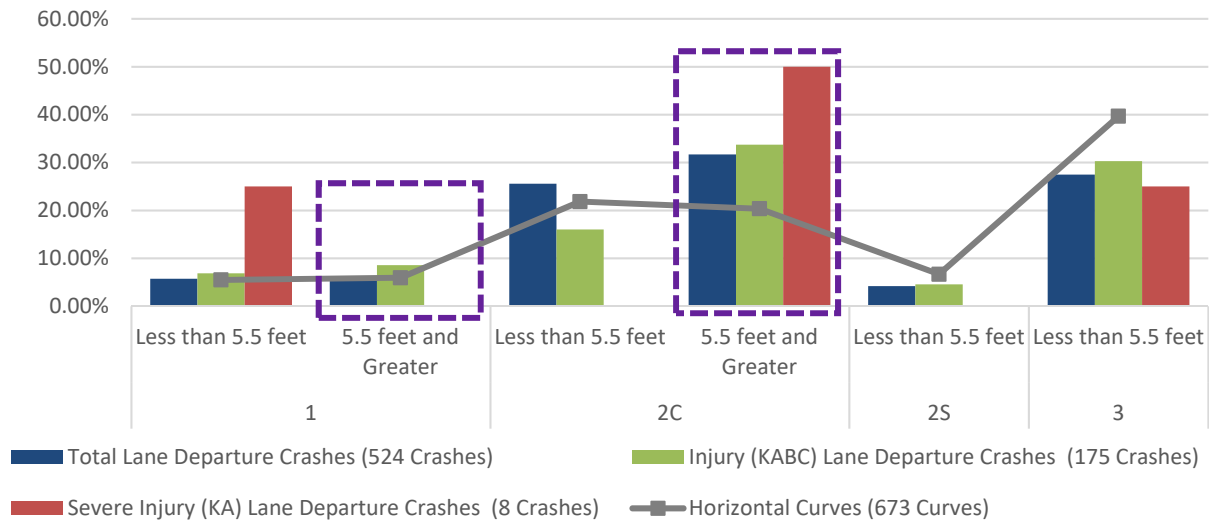
Of all the test factors it was noted that the overrepresentation for 12-foot wide lanes was only at curves with a radius of less than 1,000 feet. Curve radius is a geometric design property of curves, which is measured to the center of the inside most traveled lane. Based on the above figure, **lane width of 12 feet with a curve radius of less than 1,000 feet is recommended as a primary risk factor.**

2.4 Posted Speed Limit



Posted speed limit refers to the posted speed limit of the roadway the curve lies along; this is not an advisory or warning speed. Curves with posted speed limits of 40 to 45 MPH exhibit an overrepresentation of 9.1%, as shown in the above figure. **Posted speed limits of 40 MPH and 45 MPH are recommended as primary risk factors.**

2.5 Shoulder Width and Edge Risk



Shoulder width is measured as the width of pavement, or other roadway material outside of the traveled way. This area is important for allowing vehicles to recover if they leave the designated traveled way. Initial investigation found that shoulder 5.5 feet and wider were overrepresented. Similar to lane width, widening shoulders is a proven effective safety countermeasure. Charts developed to further investigate the overrepresentation of shoulder widths include combinations with the following:

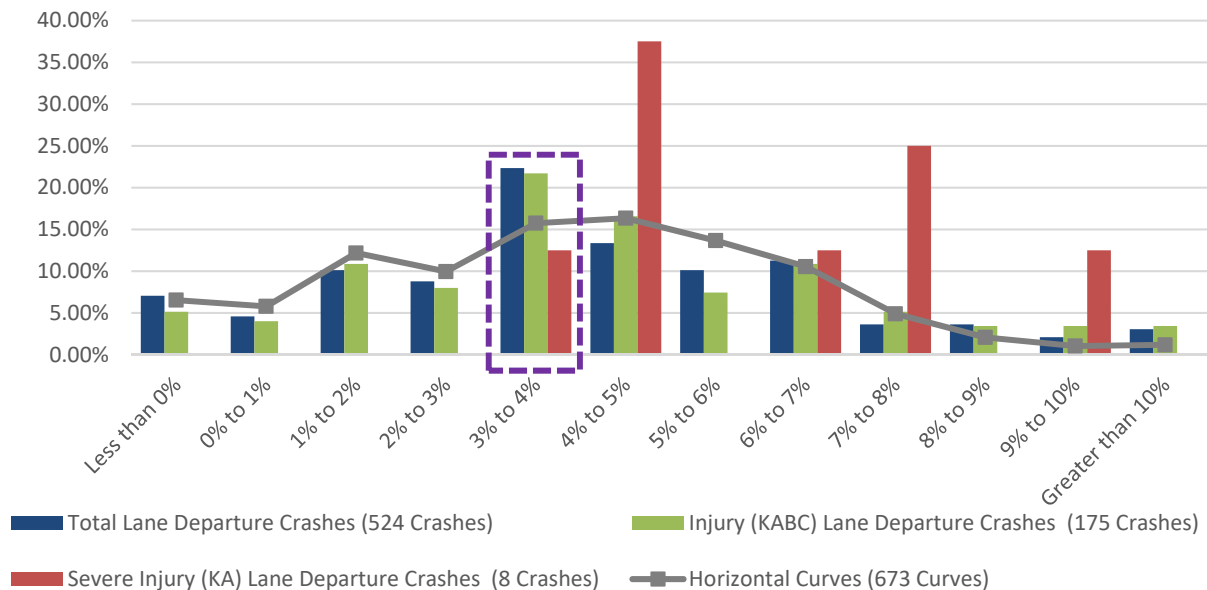
- Posted speed limit
- Area type
- Absence of guard rail
- Edge risk rating

Edge risk rating refers to the condition beyond the traveled way in terms of vehicle recovery once a vehicle leaves the travel lane. Edge risk ratings are specifically defined as:

- 1 – Usable shoulder, reasonable clear zone
- 2C – Usable shoulder, roadside with fixed objects
- 2S – No usable shoulder, reasonable clear zone
- 3 – No usable shoulder, roadside with fixed objects

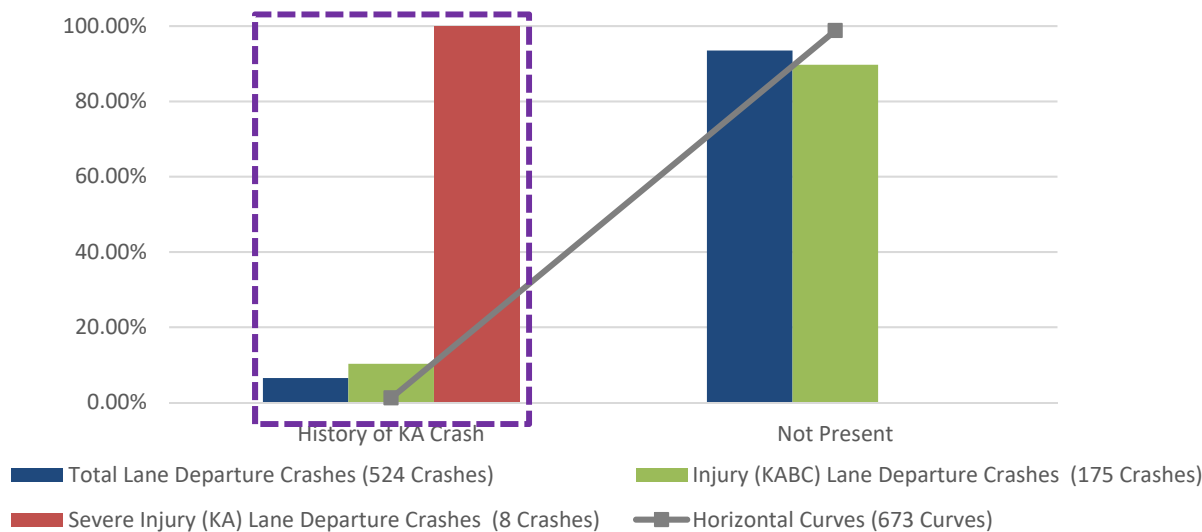
Curves with shoulders widths of 5.5 feet or greater and a clear zone rating of 2C exhibit an overrepresentation of 13.3%. **Shoulder widths that are 5.5 feet or greater and an edge risk of 2C should be considered as a primary risk factor. Shoulder widths of 5.5 feet or greater and an edge risk rating of 1 show mild overrepresentation (2.7%) and are recommended as a secondary risk factor.**

2.6 Superelevation



Superelevation is the amount the outer edge of a roadway curve is banked above the inner edge of the curve. Superelevation equal or greater than 3 percent and less than 4 percent are overrepresented by 5.9%, as shown in the above chart. Due to this overrepresentation, **superelevation greater than or equal to 3 percent and less than 4 percent is recommended as a primary risk factor.**

2.7 Presence of a Fatal or Severe Injury (KA) Crash

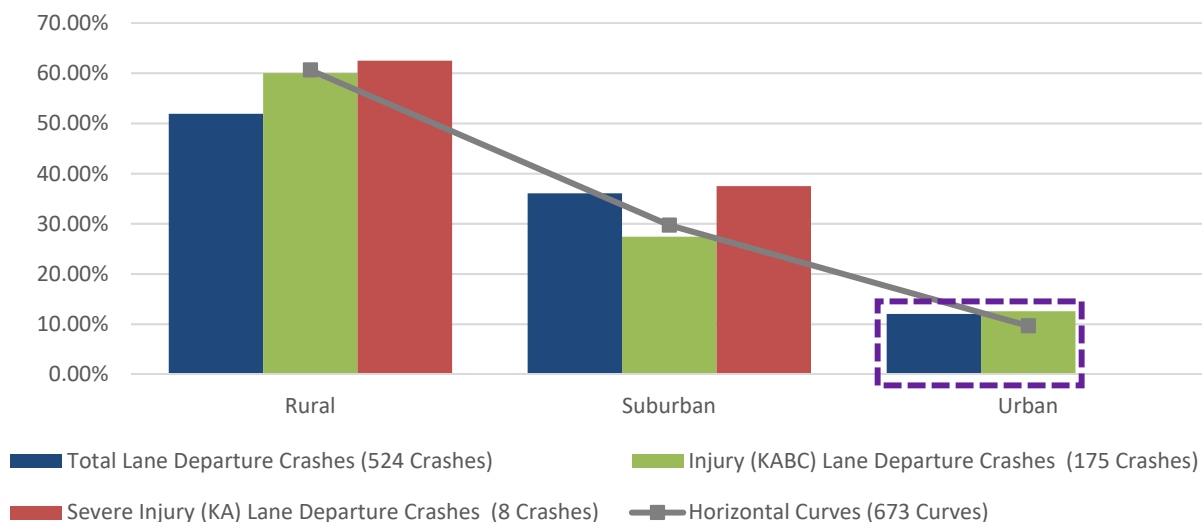


Curves with at least one fatal or severe injury (K or A) crash during the study period are overrepresented for injury lane departure crashes by 9.1% and are recommended as a primary risk factor. This risk factor will help to prioritize lane departure KA crashes within the region.

3 Secondary Risk Factors

The following three roadway factors were identified as secondary risk factors through an evaluation of overrepresentation of injury crashes. In the following charts, a roadway feature is considered overrepresented when the green bar is above the grey line. When the green bar is below the grey line a factor is not considered overrepresented. The degree of overrepresentation is determined as the difference between the green bar (proportion of injury crashes) and the grey line (proportion of curves). Secondary risk factors exhibit overrepresentation greater than or equal to 1% but less than 5% across the analysis network. The following secondary risk factors are presented in alphabetical order. There is no recommended prioritization of these factors based on degree of overrepresentation or other considerations.

3.1 Area Type

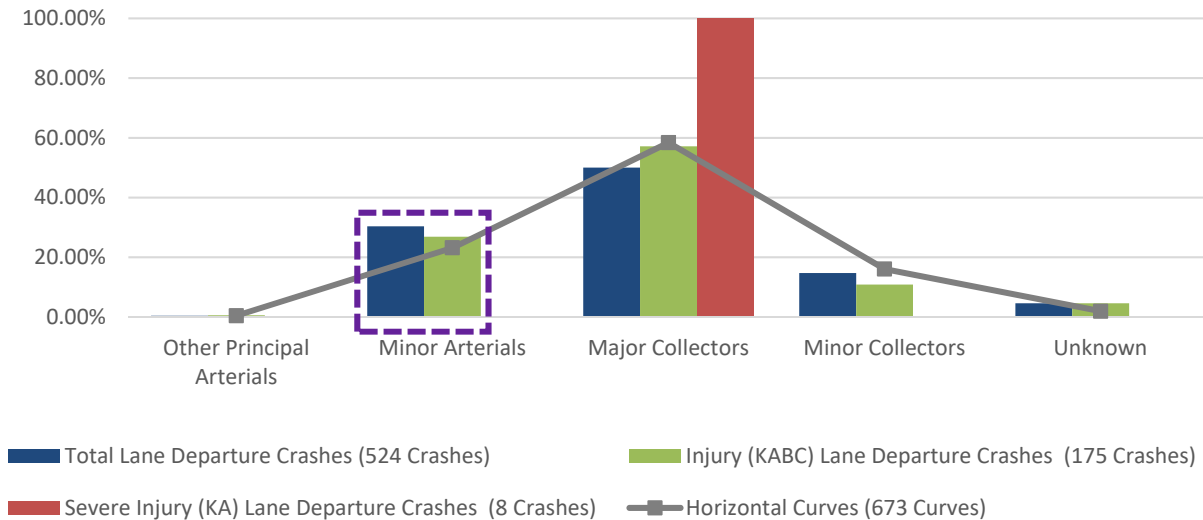


Area type is classified based on the ITE Context Zone Definitions (<https://www.ite.org/pub/?id=e1cfb244-2354-d714-517d-2004292b5f99>) where:

- “Rural” indicates a natural landscape or agricultural activity and natural features (ITE zones C-1 and C-2).
- “Suburban” indicates detached buildings with landscaped yards (ITE zone C-3).
- “Urban” indicates everything from predominantly detached buildings with a balance between landscape and buildings with pedestrians present to attached buildings forming a sense of enclosure and continuous street wall landscaping within the public right of way with the highest pedestrian and transit activity (ITE zones C-4, C-5, and C-6).

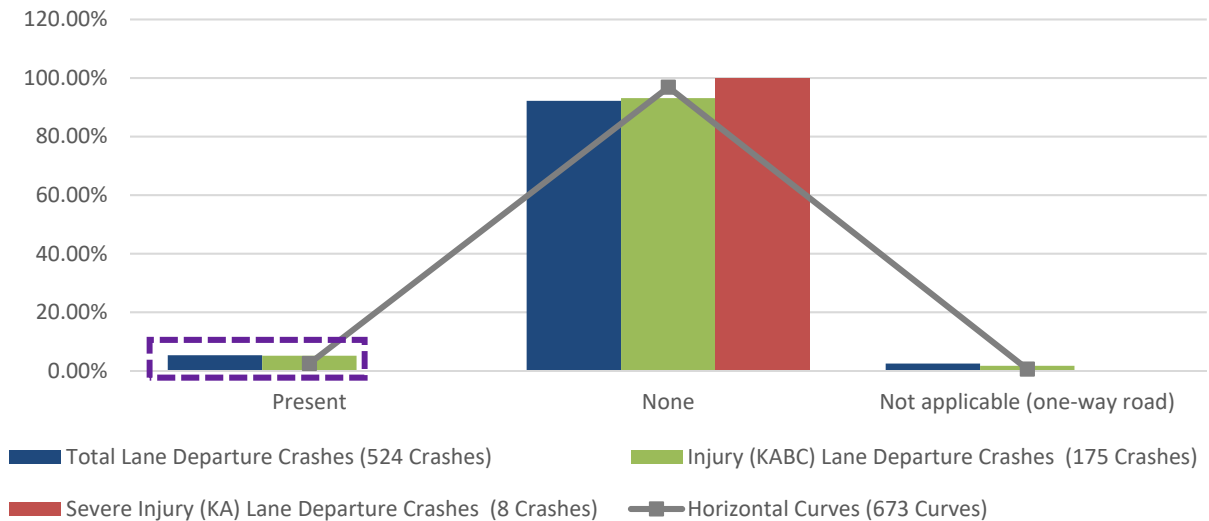
Urban area type is overrepresented by 2.9%. Due to this overrepresentation, **urban area type is recommended as a secondary risk factor.**

3.2 Functional Classification



Minor Arterial curves are overrepresented by 3.7%. As a result of this overrepresentation **Minor Arterial curves are recommended as a secondary risk factor.**

3.3 Median



Presence of a median includes grass, raised pavement, or painted medians but excludes two-way left-turn lanes. Median presence is overrepresented by 2.6%. While presence of a median accounts for a small portion of study curve, **presence of a median is recommended as a secondary risk factor.**

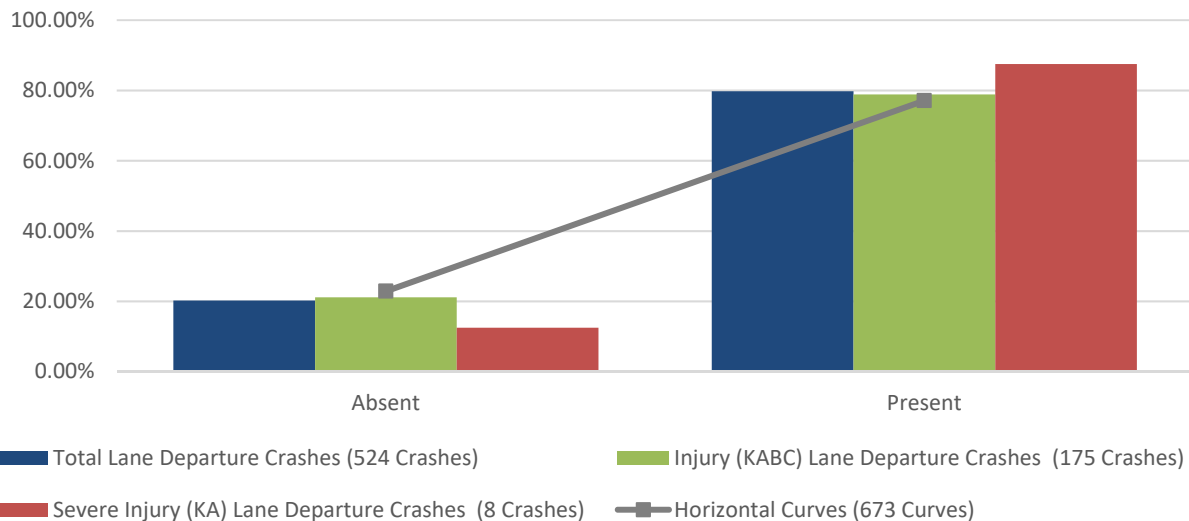
4 Features Not Recommended as Risk Factors

The following factors were considered but are not recommended as primary or secondary risk factors. There are three primary reasons for potential factors to be excluded as risk factors:

- There is no apparent overrepresentation relating the factor to increased risk of a lane departure crash at curves.
- The overrepresentation exhibited by the factor is directly related to the overrepresentation exhibited by another factor. If two factors highlight the same risk pattern, only one factor should be considered to avoid duplicating the risk those factors represent.
- There is mild overrepresentation for a factor, however the factor does not logically relate to an increase risk for a crash, i.e. the presence of sidewalks in the region is mildly overrepresented (1.3%), however the presence of sidewalks does not lead to a logical connection with or potential project for lane departure crashes at curves. This distinction is based on engineering judgement.

The following factors are presented in alphabetical order. Additional information is provided for each factor as to why it is not recommended as a primary or secondary risk factor.

4.1 Curve Delineation

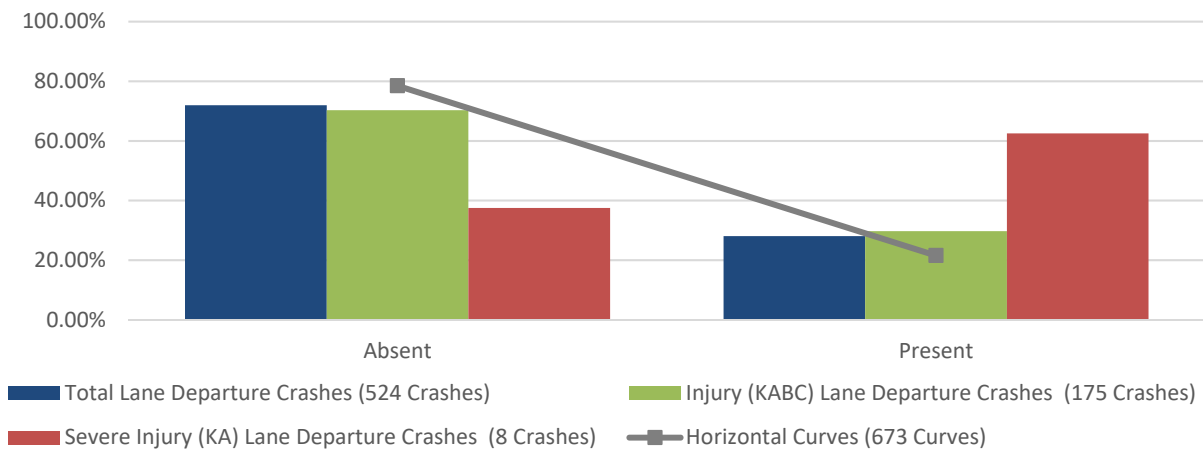


Delineators, including raised pavement markers, chevron signs, arrow boards, and retroreflective delineators are installations meant to serve as visual guides and to assist drivers in navigating curves. The absence of delineation is not overrepresented within the region. Conversely, it is worth noting that curve delineation measures are a proven countermeasure used to reduce crash frequency at curve locations.

It is likely that the delineators may have been installed at locations that were or are consistently experiencing a high frequency of crashes or have been proactively installed given they are a proven safety countermeasure known to reduce and prevent crashes on curves.

Due to the purpose for which delineators have likely been installed and the lack of overrepresentation, the absence of delineators is not recommended as a risk factor. Furthermore, improving delineation should be considered as one potential step to reduce lane departure crashes in the next steps of this project.

4.2 Guide Rail

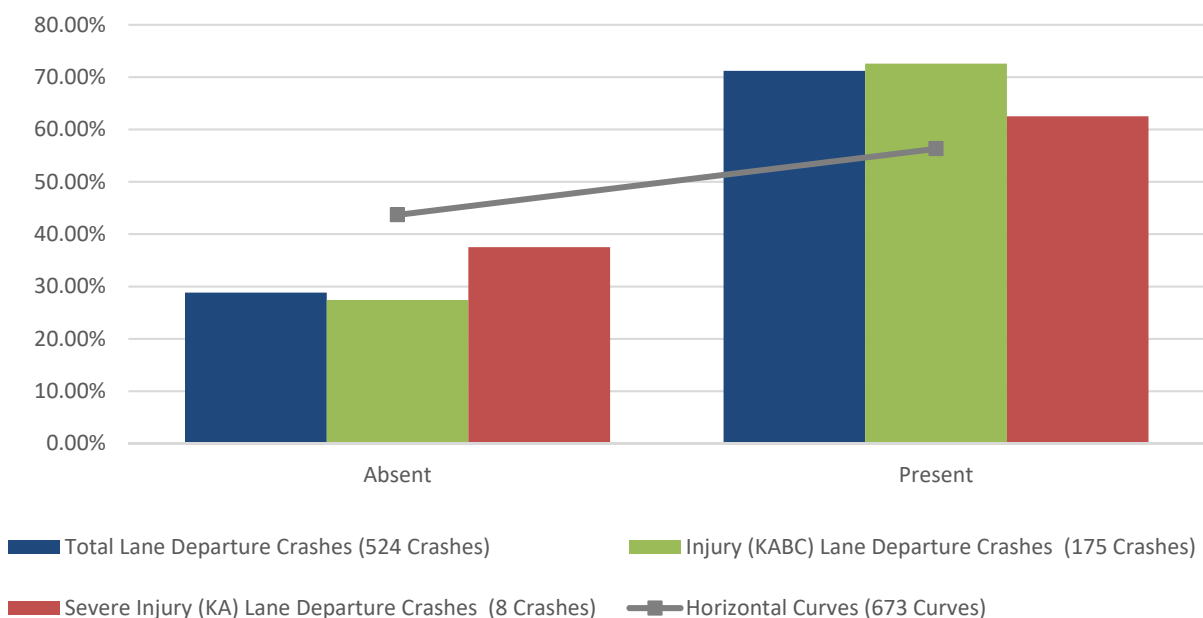


Guide rail installations are roadside barriers which reduce the severity of crashes when vehicles leave the roadway. Sites where guide rail is absent show no overrepresentation.

It is likely that guide rail may have been installed at locations that were or are consistently experiencing a high frequency of severe lane departure crashes or have been proactively installed given they are a proven safety countermeasure known to reduce the severity of crashes on curves.

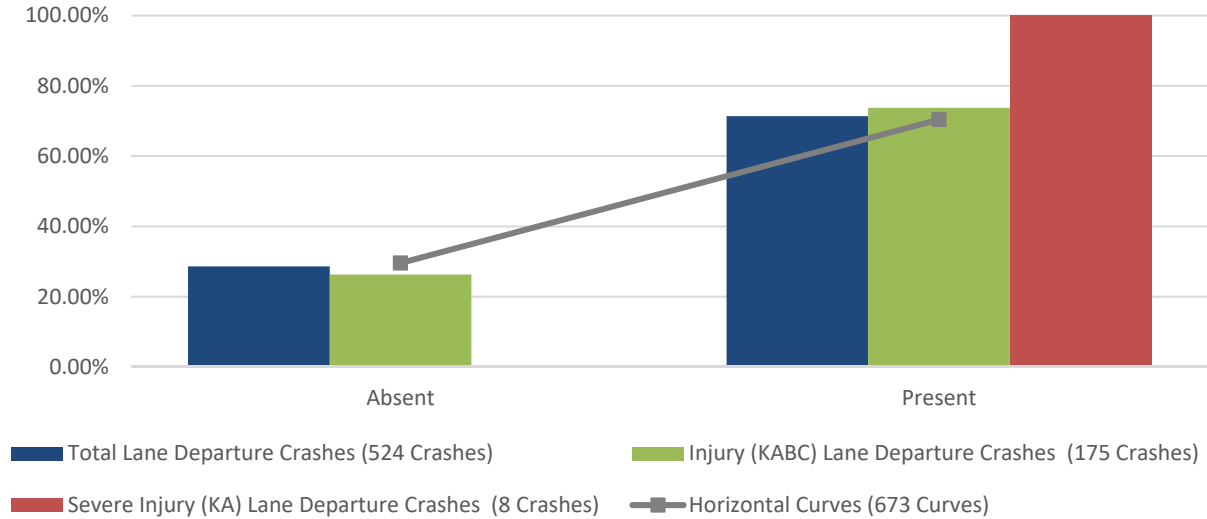
Due to the purpose for which guide rail may have likely been installed and the lack of overrepresentation, the absence of guide rail is not recommended as a risk factor. Furthermore, installing guide rail should be considered as one potential step to reduce the severity of lane departure crashes in the next steps of this project.

4.3 Highway Lighting



Highway lighting helps drivers navigate curves, identify other vehicles, and alert drivers to unexpected roadway features along curves. Unlit curves are underrepresented by 20.3%. Furthermore, highway lighting may have been installed as a countermeasure at locations experiencing a high frequency of crashes. **This underrepresentation means absence of highway lighting is not recommended as a primary or secondary risk factor.**

4.4 Horizontal Curve Warning Sign

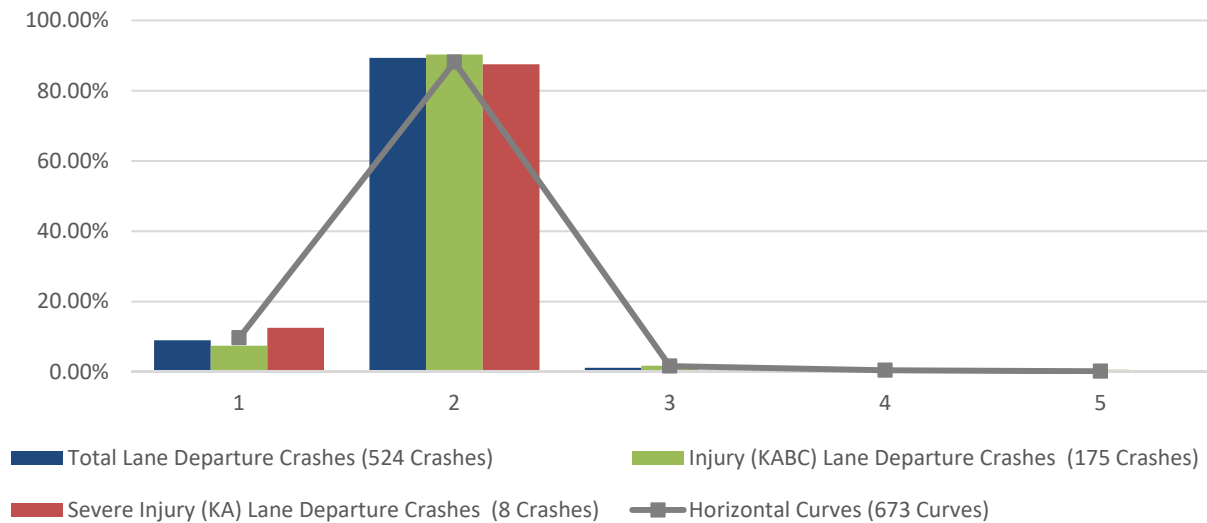


Approximately 29.6% of curves did not have curve warning signs. These curves showed no overrepresentation for lane departure crashes, indicating that the absence of horizontal curve warning signs should not be a risk factor. Conversely, it is worth noting that curves with warning signs are overrepresented based on proportion of curve inventory. However, curve warning signs are typically a countermeasure used to reduce crash frequency at curve locations.

It is likely that the warning signs were installed at locations that were or are consistently experiencing a high frequency of crashes or have been proactively given they are a proven safety countermeasure known to reduce and prevent crashes on curves.

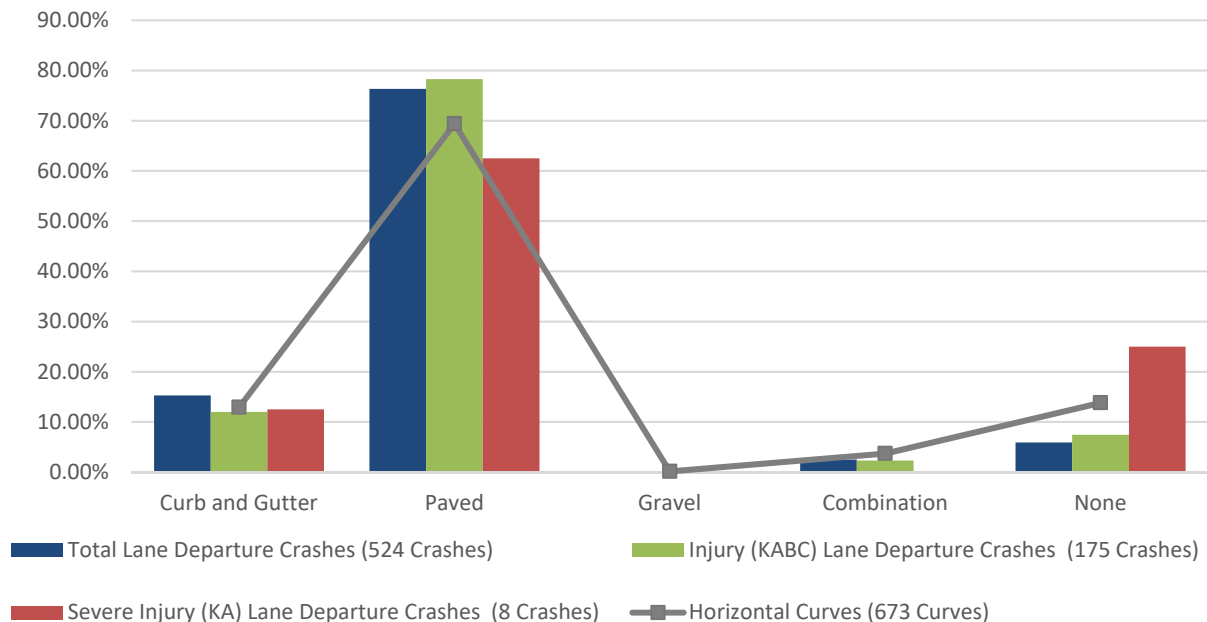
Due to the purpose for which the warning signs have likely been installed, the presence of curve warning signs should not be considered as a risk factor. However, installing appropriate curve warning signs, as directed by the Manual for Uniform Traffic Control Devices, should be considered as one potential step to reduce the frequency of lane departure crashes in the next steps of this project.

4.5 Number of Lanes



Number of lanes refers to the number of through travel lanes present along the entirety of a curve. The count does not include turn lanes. The number of lanes along most curves in the region was two, accounting for 88.1% of all curves. These curves are overrepresented by 2.2%, however, 2-lane roads are considered the base condition for safety. Deviations from 2-lanes should be considered for potential risk, particularly given how uncommon it is. No other number of lanes shows any overrepresentation; therefore, **number of lanes is not recommended as a risk factor.**

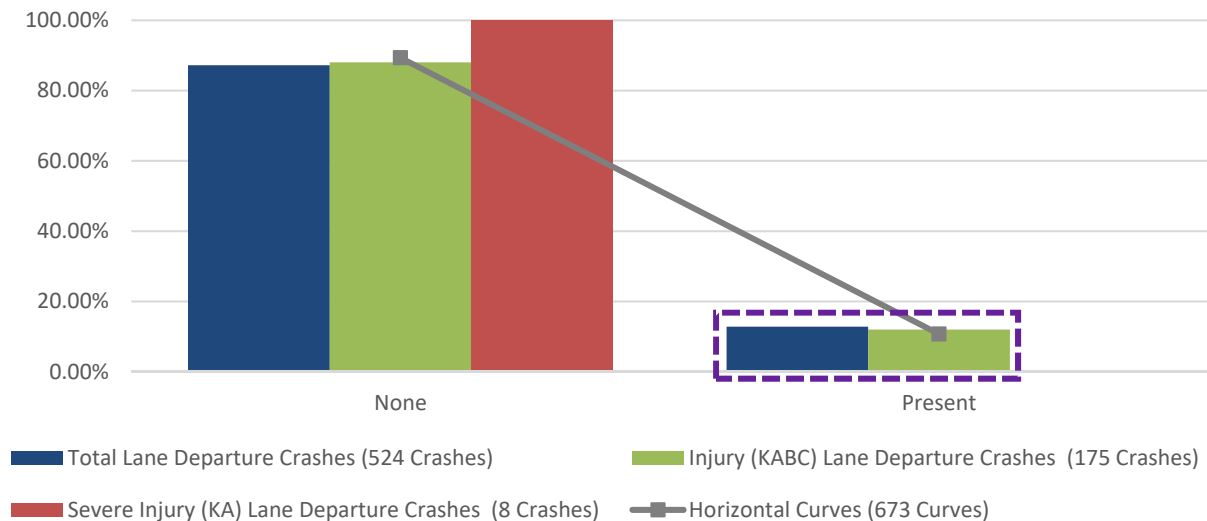
4.6 Shoulder Type



Shoulder type refers to the material immediately adjacent to the traveled way. Well-designed shoulders allow vehicles to safely return to the traveled way after a roadway departure. Within the region, paved shoulders exhibit overrepresentation of 8.9%. **Despite this overrepresentation, paved shoulders should**

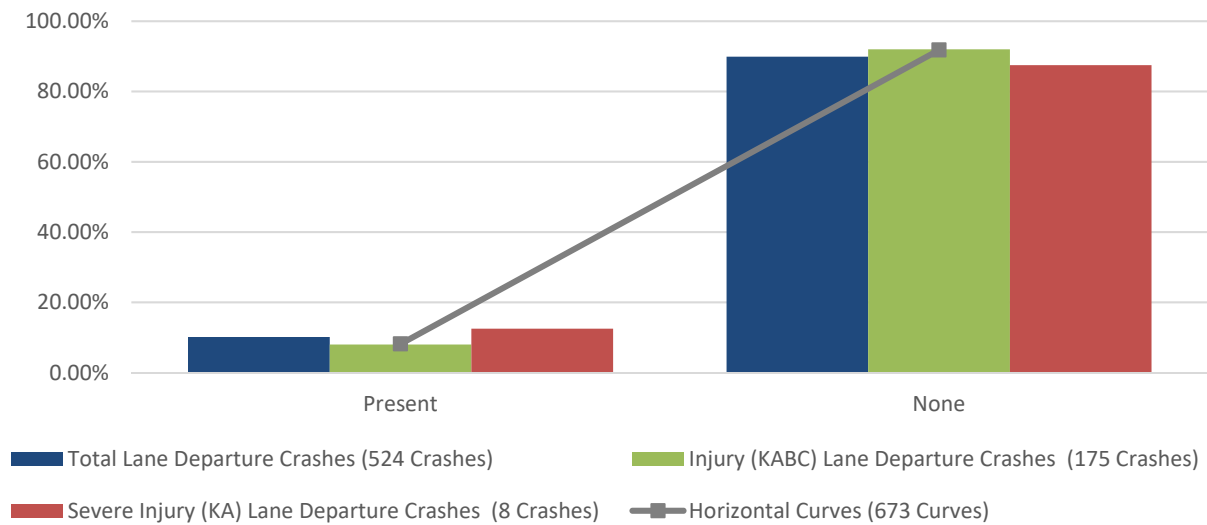
not be considered a risk factor as the risk associated with these curves is already captured in the shoulder width/edge risk combined risk factor.

4.7 Sidewalk



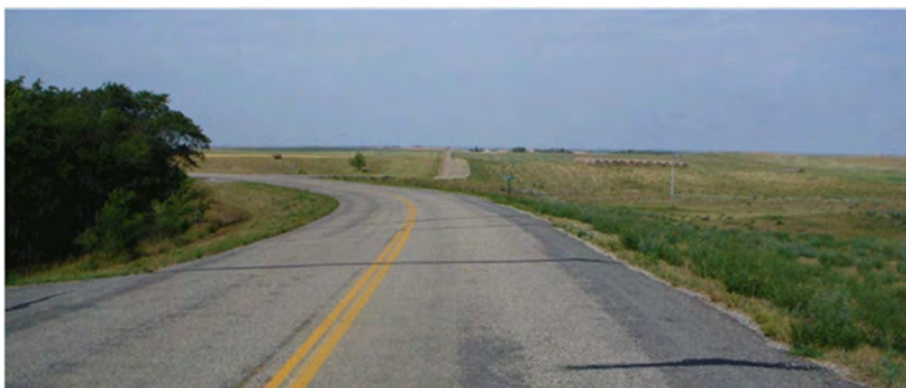
Curves with sidewalks represent an overrepresentation of 1.3%. The presence or absence of sidewalks does not directly or indirectly impact lane departure crashes at curves. If sidewalks were identified as a risk factor, there are no actionable countermeasures related to sidewalks that could improve safety at curves, in terms of lane departure crashes. **Despite this mild overrepresentation, presence of a sidewalk is not recommended as a primary or secondary risk factor.**

4.8 Visual Trap



A visual trap is a minor road, tree line, powerline, or other features located along the tangent to the minor road which may make the road appear to continue straight instead of curved. An example of a visual trap is shown in the figures below.

Within the region, a visual trap was overrepresented less than 1%. As such, visual trap is not recommended as a primary or secondary risk factor.



SJTPO Curves
Risk Factor Scoring Table

STPO Curve			Primary Risk Factor										Crash History				
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge Risk 2C	Super-elevation 3% 4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
00000542	1.28	Salem	☆		☆	☆	☆	☆		☆	☆			6	0	0	0
05000620	0.71	Cumberland	☆	☆		☆	☆	☆	☆					6		4	1
05000603	5.9	Salem	☆	☆	☆		☆	☆			☆			5.5	7	2	0
05000619	2.16	Atlantic	☆	☆	☆		☆			☆	☆	☆		5.5	1	1	0
05000654	0.26	Salem	☆	☆	☆	☆	☆			☆				5.5	1	0	0
06000655	5.07	Salem	☆	☆	☆		☆	☆			☆			5.5	3	2	0
00000525	0.56	Salem	☆	☆	☆	☆	☆			☆	☆			5	0	0	0
01000608	2.67	Salem	☆		☆	☆		☆		☆	☆			5	2	2	0
05000619	17.42	Salem	☆	☆	☆		☆			☆	☆			5	1	1	0
05000631	4.21	Atlantic		☆	☆	☆	☆	☆						5	3	0	0
06000678	0.82	Atlantic		☆	☆	☆	☆							5	2	0	0
00000552	22.73	Salem	☆	☆	☆		☆						☆	4.5	1	1	0
00000561	23.86	Salem	☆		☆	☆	☆			☆				4.5	2	0	0
01111050	0.66	Salem	☆		☆	☆		☆			☆			4.5	22	6	0
05000603	1.3	Atlantic	☆	☆	☆	☆							☆	4.5	0	0	0
05000611	2.93	Salem	☆		☆	☆		☆					☆	4.5	0	0	0
05000619	15.22	Salem	☆		☆	☆	☆	☆			☆			4.5	0	0	0
05000654	0.38	Salem	☆		☆	☆		☆		☆				4.5	1	0	0
05071003	1.38	Cape May	☆	☆	☆			☆						4.5	0	0	0
06000649	0.7	Salem	☆		☆	☆	☆				☆			4.5	1	0	0
06000649	0.84	Cape May	☆	☆		☆	☆				☆			4.5	1	0	0
06000649	1.29	Salem	☆	☆		☆	☆	☆			☆			4.5	0	0	0
06000649	3.02	Salem	☆		☆	☆	☆				☆			4.5	1	0	0
06000649	4.46	Salem	☆	☆		☆	☆				☆			4.5	0	0	0
00000540	31.48	Salem	☆		☆	☆	☆	☆						4	2	1	0
00000542	3.71	Atlantic	☆	☆	☆	☆								4	2	2	0
00000548	8.71	Cumberland	☆	☆	☆		☆			☆	☆			4	0	0	0
00000552	6.05	Salem	☆		☆		☆				☆			4	3	0	0
00000553	2.17	Atlantic	☆			☆		☆			☆		☆	4	0	0	0
00000555	12.11	Cumberland	☆	☆		☆				☆				4	2	2	0
00000555		Salem		☆	☆	☆	☆			☆	☆			4	0	0	0
00000575	8.86	Cumberland	☆	☆						☆	☆	☆	☆	4	2	1	0
01000619	3.11	Salem	☆		☆	☆				☆	☆			4	1	0	0
01000635	0.05	Salem	☆		☆			☆		☆	☆			4	0	0	0
01000646	0.13	Cape May	☆		☆			☆			☆	☆		4	0	0	0
05000609	1.04	Cumberland	☆	☆	☆		☆							4	0	0	0
05000619	7.92	Atlantic	☆		☆			☆		☆	☆			4	0	0	0
05000620	2.08	Cumberland	☆	☆		☆	☆				☆			4	0	0	0
05000622	0.84	Cumberland	☆		☆		☆			☆		☆		4	0	0	0
05000639	1.27	Cumberland	☆			☆			☆					4	0	0	0
05000654	2.25	Cumberland	☆	☆	☆		☆							4	3	1	1
06000678	1.69	Atlantic	☆			☆	☆	☆						4	4	2	0
06101007	0.71	Atlantic	☆		☆		☆	☆						4	2	1	0
17000610	2.82	Atlantic	☆		☆	☆		☆						4	1	1	0
17000639	5.01	Cape May	☆	☆			☆	☆						4	3	1	0
17000643	3.54	Atlantic	☆		☆			☆						4	0	0	0
00000540	31.37	Cumberland	☆	☆		☆		☆					☆	3.5	0	0	0
00000551	6.55	Atlantic		☆			☆	☆			☆			3.5	0	0	0

SITPO Curves
Risk Factor Scoring Table

SITPO Curve			Primary Risk Factor								Crash History						
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge Risk 2C	Super-elevation 3% or 4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
00000553__	14.26	Atlantic		☆	☆		☆				☆			3.5	0	0	0
00000559__	0.02	Cumberland	☆			☆	☆				☆			3.5	0	0	0
00000559__	12.18	Cumberland	☆				☆	☆		☆				3.5	4	1	1
00000559__	15.3	Atlantic		☆			☆	☆		☆				3.5	0	0	0
00000559__	15.37	Cumberland	☆		☆		☆			☆				3.5	0	0	0
00000561__	12.98	Atlantic		☆	☆	☆					☆			3.5	0	0	0
00000561__	13	Atlantic		☆	☆						☆			3.5	2	1	0
00000561__	2.47	Atlantic		☆		☆	☆				☆			3.5	1	0	0
00000561__	23.91	Cape May	☆		☆	☆				☆				3.5	1	1	0
00000561A__	3.87	Atlantic	☆			☆		☆			☆			3.5	4	2	0
00000561A__	3.95	Atlantic		☆	☆						☆			3.5	3	0	0
01000619__	0.24	Cape May	☆			☆	☆				☆			3.5	1	1	0
01000629__	0.27	Atlantic	☆	☆	☆					☆				3.5	1	1	0
01000629__	0.48	Atlantic	☆	☆	☆									3.5	0	0	0
01000646__	0.16	Cape May	☆		☆						☆	☆	☆	3.5	0	0	0
010006462__	0.14	Atlantic		☆	☆		☆				☆			3.5	6	4	0
01000651__	11.06	Cape May	☆		☆	☆					☆			3.5	3	0	0
01000651__	11.3	Cape May	☆		☆	☆					☆			3.5	4	0	0
01021381__	2.5	Salem	☆					☆		☆			☆	3.5	1	1	0
01111139__	1.21	Atlantic	☆	☆		☆						☆		3.5	1	0	0
011111280__	0.01	Cumberland	☆		☆	☆						☆		3.5	0	0	0
01151100__	0.22	Cumberland	☆		☆			☆		☆				3.5	0	0	0
01151100__	0.37	Cape May	☆		☆			☆		☆				3.5	0	0	0
05000603__	7.35	Cumberland	☆			☆	☆				☆			3.5	2	0	0
05000619__	0.83	Atlantic		☆			☆	☆			☆			3.5	0	0	0
05000631__	3.5	Cumberland		☆	☆			☆					☆	3.5	5	4	0
06000649__	1.39	Atlantic		☆		☆	☆				☆			3.5	3	2	0
06000649__	1.76	Salem			☆		☆				☆			3.5	0	0	0
06000649__	2.27	Salem	☆			☆	☆				☆			3.5	1	1	0
06000649__	2.42	Salem	☆			☆	☆				☆			3.5	0	0	0
06000649__	3.07	Salem			☆	☆	☆				☆			3.5	1	0	0
06000670__	13.15	Cumberland	☆		☆		☆				☆			3.5	3	0	0
17000607__	0.68	Atlantic	☆	☆			☆			☆				3.5	1	1	0
17000618__	0.15	Cumberland	☆		☆		☆							3.5	0	0	0
00000540__	1.68	Atlantic	☆	☆			☆							3	1	0	0
00000542__	1.47	Cumberland			☆	☆				☆	☆			3	0	0	0
00000542__	3.26	Atlantic	☆		☆	☆								3	0	0	0
00000542__	4.28	Atlantic	☆		☆	☆								3	1	1	0
00000542__	6	Atlantic	☆			☆	☆							3	1	1	0
00000548__	8.78	Atlantic	☆	☆				☆						3	0	0	0
00000550__	3.38	Atlantic		☆	☆				☆					3	9	5	1
00000550__	6.54	Atlantic				☆	☆	☆						3	1	1	0
00000552__	21.28	Cumberland		☆			☆	☆						3	0	0	0
00000552__	24.47	Atlantic	☆	☆			☆							3	1	0	0
00000559__	18.95	Cumberland	☆		☆		☆							3	0	0	0
00000559__	19.57	Atlantic	☆	☆			☆							3	1	1	0
00000559__	27.66	Atlantic	☆	☆	☆				☆					3	3	2	1
00000559__	6.82	Atlantic	☆	☆	☆									3	5	1	0

SITPO Curves
Risk Factor Scoring Table

SITPO Curve			Primary Risk Factor										Crash History				
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge and Risk 2C	Super-elevation 3% or 4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge and Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
00000561A	0.49	Atlantic		☆		☆		☆		☆				3	0	0	0
00000561A	3.13	Cumberland			☆			☆		☆	☆			3	1	0	0
00000561A	3.54	Atlantic		☆		☆					☆		☆	3	0	0	0
00000563	22.37	Cumberland	☆		☆	☆								3	1	1	0
00000575	17.24	Atlantic	☆	☆		☆								3	0	0	0
00000575	17.47	Atlantic	☆	☆		☆								3	0	0	0
01000606	0.39	Atlantic	☆	☆		☆								3	1	1	0
01000615	7.95	Cumberland	☆					☆		☆	☆			3	0	0	0
01000643	2.1	Cumberland	☆			☆		☆						3	1	0	0
01000685	0.03	Cumberland	☆		☆	☆								3	2	0	0
01000651	6.58	Atlantic	☆			☆					☆			3	1	0	0
01000684	1.63	Atlantic		☆		☆			☆					3	5	3	1
01021381	2.55	Cumberland					☆	☆		☆	☆			3	12	2	0
01081361	0.63	Atlantic	☆	☆		☆								3	2	1	0
01151100	0.21	Cumberland	☆		☆					☆			☆	3	0	0	0
05000603	8.04	Atlantic		☆		☆					☆		☆	3	0	0	0
05000612	1.06	Salem	☆			☆		☆						3	1	1	0
05000613	0.71	Salem	☆			☆								3	4	1	0
05000613	1.16	Salem	☆	☆			☆							3	1	0	0
05000619	7.93	Salem	☆	☆						☆	☆			3	0	0	0
05000619	9.4	Cumberland	☆		☆					☆	☆			3	0	0	0
05000621	2.7	Cumberland	☆				☆			☆	☆			3	0	0	0
05000622	1.01	Cape May	☆		☆					☆			☆	3	0	0	0
05000626	0.77	Cumberland			☆		☆			☆	☆			3	1	0	0
05000628	2	Salem	☆				☆	☆						3	0	0	0
05000631	1.45	Salem		☆	☆		☆							3	1	1	0
05000631	3.71	Salem		☆			☆	☆						3	3	1	0
05000638	0.24	Cape May		☆		☆		☆						3	0	0	0
05000639	1.7	Atlantic		☆	☆					☆	☆			3	1	1	0
05000648	0.24	Atlantic	☆			☆								3	1	0	0
05000654	0.83	Atlantic			☆		☆		☆					3	7	3	1
05000668	0.67	Atlantic	☆	☆										3	0	0	0
05051100	0.91	Cumberland			☆		☆	☆						3	0	0	0
05051100	0.92	Cumberland			☆		☆	☆						3	0	0	0
06000616	4.15	Cumberland	☆		☆	☆								3	0	0	0
06000628	0.84	Cumberland			☆		☆	☆						3	1	0	0
06000646	1	Atlantic	☆			☆	☆							3	0	0	0
06000655	0.13	Atlantic	☆		☆						☆		☆	3	0	0	0
06000678	0.69	Atlantic	☆			☆		☆						3	0	0	0
06000698	8.61	Cape May	☆		☆	☆								3	0	0	0
06000710	0.12	Cape May	☆		☆			☆						3	0	0	0
17000602	3.58	Atlantic	☆	☆			☆							3	1	0	0
17000610	2.16	Cape May		☆		☆		☆						3	0	0	0
17000626	4.53	Cape May				☆		☆						3	0	0	0
17000639	1.74	Atlantic		☆	☆		☆							3	0	0	0
17000643	2.89	Cape May		☆			☆		☆					3	2	2	1
17000644	1.87	Atlantic	☆			☆								3	0	0	0
17000667	0.12	Atlantic	☆	☆	☆									3	1	0	0

SITPO Curves
Risk Factor Scoring Table

SITPO Curve			Primary Risk Factor										Crash History				
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge Risk 2C	Super-elevation 3% or 4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
17000658_Z100480	0	Atlantic	☆		☆			☆						3	0	0	0
17000675_	1.44	Atlantic	☆		☆			☆						3	0	0	0
00000548_	0.17	Atlantic	☆		☆				☆					2.5	2	0	0
00000551_	0.98	Atlantic	☆				☆				☆			2.5	0	0	0
00000551_	1.34	Atlantic	☆				☆				☆			2.5	1	0	0
00000552_	13.71	Atlantic			☆		☆				☆			2.5	0	0	0
00000552_	25.08	Cumberland	☆		☆								☆	2.5	7	4	0
00000552_	8.61	Cape May		☆			☆				☆			2.5	1	1	0
00000553_	1.87	Atlantic		☆		☆					☆			2.5	0	0	0
00000553_	12.56	Atlantic	☆					☆			☆			2.5	2	1	0
00000553_	13.13	Atlantic			☆		☆				☆			2.5	1	0	0
00000553_	15.35	Atlantic			☆		☆				☆			2.5	7	3	0
00000553_	15.49	Atlantic			☆		☆				☆			2.5	4	1	0
00000553_	29.29	Atlantic			☆		☆			☆				2.5	5	4	0
00000553_	5.01	Atlantic			☆			☆			☆			2.5	0	0	0
00000553_	8.32	Atlantic		☆							☆			2.5	1	1	0
00000559_	1.34	Atlantic				☆	☆			☆				2.5	0	0	0
00000559_	10.86	Cape May		☆				☆		☆				2.5	0	0	0
00000559_	3.34	Atlantic	☆		☆						☆			2.5	2	0	0
00000559_	4.05	Atlantic	☆					☆			☆			2.5	0	0	0
00000559_	5	Atlantic		☆				☆			☆			2.5	0	0	0
00000559A_	7.46	Atlantic			☆		☆				☆			2.5	2	0	0
00000559A_	8.99	Atlantic	☆					☆			☆			2.5	4	0	0
00000559A_	9.39	Atlantic			☆		☆				☆			2.5	1	1	0
00000561_	16.75	Atlantic	☆			☆					☆			2.5	0	0	0
00000561A_	4.74	Atlantic		☆		☆					☆			2.5	0	0	0
00000561A_	4.89	Atlantic	☆			☆					☆			2.5	0	0	0
00000561A_	5.15	Atlantic	☆			☆					☆			2.5	1	0	0
00000561A_	5.16	Atlantic	☆			☆					☆			2.5	0	0	0
00000561A_	5.58	Atlantic			☆	☆					☆			2.5	0	0	0
01000601_	0.03	Atlantic	☆		☆					☆				2.5	2	0	0
01000615_	2.13	Atlantic			☆	☆					☆			2.5	0	0	0
01000615_	6.14	Atlantic	☆			☆					☆			2.5	0	0	0
01000616_	0.09	Atlantic	☆		☆					☆				2.5	0	0	0
01000619_	0.98	Atlantic				☆	☆				☆			2.5	0	0	0
01000619_	2.17	Atlantic				☆	☆				☆			2.5	0	0	0
01000629_	0.16	Atlantic	☆		☆					☆				2.5	1	0	0
010006462_	0.07	Atlantic			☆			☆			☆			2.5	2	1	0
01000651_	11.25	Atlantic			☆	☆					☆			2.5	1	0	0
01000682_	1.53	Cumberland	☆		☆								☆	2.5	0	0	0
01000685_	0.14	Atlantic	☆	☆							☆			2.5	1	0	0
01031189_	0.62	Atlantic	☆		☆						☆			2.5	2	0	0
01000651_	4.91	Atlantic	☆					☆			☆			2.5	2	0	0
01111280_	0.6	Cumberland			☆								☆	2.5	0	0	0
01151100_	0.35	Atlantic	☆		☆					☆				2.5	0	0	0
01211150_	0.03	Atlantic	☆		☆						☆			2.5	2	0	0
05000603_	2.57	Atlantic	☆	☆							☆			2.5	2	0	0
05000610_	3.92	Salem	☆	☆									☆	2.5	1	0	0

SITPO Curves
Risk Factor Scoring Table

SITPO Curve			Primary Risk Factor										Crash History				
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge and Risk 2C	Super-elevation 3%-4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge and Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
05000610	6.36	Cape May	☆	☆									☆	2.5	2	0	0
05000613	2.12	Salem				☆		☆					☆	2.5	0	0	0
05000620	2.41	Cumberland	☆			☆							☆	2.5	0	0	0
05000629	0.22	Cumberland	☆		☆								☆	2.5	0	0	0
05000639	0.27	Cumberland	☆			☆							☆	2.5	0	0	0
05000654	1.74	Cumberland	☆		☆								☆	2.5	1	0	0
05000657	6.27	Atlantic		☆				☆					☆	2.5	2	0	0
05000657	9.62	Cumberland	☆			☆							☆	2.5	1	1	0
05071025	0.47	Atlantic	☆		☆					☆				2.5	2	0	0
06000608	3.27	Atlantic	☆				☆				☆			2.5	0	0	0
06000649	2.09	Atlantic				☆	☆				☆			2.5	1	0	0
06000649	3.67	Atlantic	☆			☆					☆			2.5	0	0	0
06000655	4.8	Atlantic		☆			☆				☆			2.5	2	0	0
06000671	2.5	Cape May		☆			☆				☆			2.5	0	0	0
06000671	3.2	Atlantic	☆		☆						☆			2.5	0	0	0
17000625	3.53	Atlantic	☆		☆					☆				2.5	0	0	0
00000540	12.27	Atlantic	☆		☆									2	2	0	0
00000540	12.49	Atlantic	☆					☆						2	1	0	0
00000540	17.22	Cape May		☆				☆						2	1	0	0
00000540	42.86	Atlantic	☆	☆										2	2	1	0
00000542	4.56	Atlantic		☆		☆								2	0	0	0
00000542	6.99	Atlantic	☆			☆								2	3	1	0
00000548	0.22	Atlantic	☆		☆									2	0	0	0
00000548	8.13	Atlantic			☆		☆							2	0	0	0
00000550	7.56	Atlantic					☆	☆						2	0	0	0
00000552	18.23	Atlantic	☆		Atlantic		☆							2	5	1	0
00000552	19.31	Atlantic	☆				☆							2	1	0	0
00000552	25.31	Atlantic	☆		Atlantic		☆							2	2	1	0
00000557	14.85	Cape May		☆				☆						2	0	0	0
00000559	10.06	Cumberland	☆	☆										2	0	0	0
00000559	14.75	Atlantic	☆		☆									2	4	1	0
00000559	20.76	Atlantic	☆			☆								2	3	0	0
00000559	28.56	Atlantic	☆					☆						2	0	0	0
00000559	6.2	Atlantic		☆				☆						2	1	0	0
00000559	6.42	Atlantic	☆		☆									2	1	1	0
00000559	6.97	Atlantic		☆	☆									2	2	2	0
00000559	8.43	Atlantic	☆	☆										2	0	0	0
00000561A	1.15	Atlantic	☆			☆								2	2	1	0
00000561A	11.67	Atlantic		☆		☆								2	0	0	0
00000561A	2.83	Atlantic			☆					☆	☆			2	1	0	0
00000561A	7.22	Atlantic	☆			☆								2	2	1	0
01000647	0.01	Atlantic	☆		☆									2	2	0	0
00000563	23.14	Atlantic	☆			☆								2	0	0	0
00000563	23.49	Atlantic	☆			☆								2	0	0	0
00000575	16.56	Atlantic	☆		☆									2	0	0	0
00000575	18.06	Atlantic	☆					☆						2	0	0	0
00000575	19.46	Atlantic	☆		☆									2	0	0	0
00000581	3.44	Cumberland	☆	☆										2	0	0	0

SITPO Curves
Risk Factor Scoring Table

SITPO Curve			Primary Risk Factor										Crash History				
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge Risk 2C	Super-elevation 3% or 4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
00000581__	4.33	Cumberland		☆				☆						2	0	0	0
00000581__	5.08	Atlantic		☆				☆						2	1	0	0
00000581__	7.79	Atlantic	☆					☆						2	1	0	0
00000585__	3.88	Atlantic	☆							☆	☆			2	7	2	0
00000585__	8.64	Atlantic	☆							☆	☆			2	1	1	0
00000585__	9.29	Atlantic			☆					☆	☆			2	1	1	0
01000608__	2.78	Atlantic				☆				☆	☆			2	0	0	0
01000608__	2.84	Atlantic				☆				☆	☆			2	0	0	0
01000610__	1.35	Atlantic	☆		☆									2	1	0	0
01000613__	1.82	Atlantic	☆			☆								2	1	0	0
01000615__	1.08	Atlantic				☆		☆						2	0	0	0
01000615__	1.42	Atlantic	☆			☆								2	0	0	0
01000623__	1.69	Atlantic	☆	☆										2	0	0	0
01000643__	1.84	Atlantic	☆			☆								2	1	1	0
01000643__	3.77	Atlantic	☆			☆								2	0	0	0
01000643__	4.12	Atlantic	☆			☆								2	0	0	0
01000643__	4.25	Atlantic	☆			☆								2	0	0	0
01000647__	2.84	Atlantic	☆					☆						2	0	0	0
01000651__	2.35	Atlantic			☆	☆								2	1	1	0
01000651__	6.1	Atlantic				☆					☆			2	0	1	0
01000658__	5.1	Cumberland		☆				☆						2	0	0	0
01000662__	0.75	Atlantic	☆			☆								2	1	0	0
01000669__	4.98	Cumberland	☆	☆										2	2	1	0
01000670__	3.09	Atlantic	☆	☆										2	2	0	0
01000670__	3.38	Atlantic		☆				☆						2	0	0	0
01000670__	3.47	Atlantic	☆					☆						2	1	0	0
01000680__	0.12	Atlantic	☆		☆									2	0	0	0
01000685__	2.6	Atlantic					☆				☆			2	0	0	0
01021085__	0.05	Atlantic	☆							☆		☆		2	0	0	0
01081117__	1.54	Atlantic	☆		☆									2	0	0	0
01101009__	0.22	Atlantic	☆					☆						2	0	0	0
01101009__	1.11	Atlantic	☆			☆								2	2	0	0
01111050__	0.07	Atlantic			☆	☆								2	0	0	0
01111050__	1.08	Atlantic		☆		☆								2	0	0	0
01111050__	1.51	Atlantic	☆	☆										2	9	0	0
01111139__	0.29	Atlantic		☆		☆								2	0	0	0
01141144__	1	Atlantic	☆		☆									2	0	0	0
01141144__	1.26	Atlantic	☆		☆									2	0	0	0
01191208__	2.24	Atlantic	☆		☆									2	0	0	0
05000603__	0.31	Atlantic		☆		☆								2	0	0	0
05000603__	7.1	Atlantic	☆								☆	☆		2	0	0	0
05000608__	0.62	Atlantic	☆			☆								2	2	1	0
05000611__	0.31	Salem				☆	☆							2	1	1	0
05000612__	2.35	Cape May	☆			☆								2	0	0	0
05000612__	2.64	Salem	☆					☆						2	0	0	0
05000619__	15.59	Atlantic			☆						☆		☆	2	1	0	0
05000626__	1.27	Atlantic			☆						☆		☆	2	0	0	0
05000626__	4.61	Salem			☆		☆							2	0	0	0

SITPO Curves
Risk Factor Scoring Table

SITPO Curve			Primary Risk Factor										Crash History				
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge and Risk 2C	Super-elevation 3% or 4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge and Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
05000628__	2.64	Salem	☆				☆							2	0	0	0
05000631__	1.52	Cumberland		☆			☆							2	1	0	0
05000638__	2.17	Atlantic	☆		☆									2	0	0	0
05000639__	0.7	Atlantic				☆	☆							2	1	1	0
05000644__	2.34	Atlantic	☆			☆								2	0	0	0
05000657__	7.26	Cape May		☆			☆							2	1	1	0
05000657__	8.25	Cumberland		☆			☆							2	1	1	0
05000663__	0.73	Atlantic	☆		☆									2	0	0	0
05000668__	0.92	Atlantic	☆		☆									2	0	0	0
06000616__	4.39	Atlantic	☆			☆								2	0	0	0
06000616__	4.83	Atlantic	☆			☆								2	18	1	0
06000616__	6.16	Atlantic	☆			☆								2	0	0	0
06000646__	0.42	Atlantic			☆		☆							2	0	0	0
06000690__	0.08	Cape May		☆				☆						2	0	0	0
06141581__	0.76	Cape May				☆	☆							2	0	0	0
17000601__	5.03	Atlantic	☆		☆									2	0	0	0
17000602__	3.51	Atlantic	☆				☆							2	0	0	0
17000610__	1.46	Salem		☆		☆								2	2	1	0
17000610__	2.67	Cape May	☆			☆								2	2	1	0
17000611__	1.3	Cape May		☆	☆									2	0	0	0
17000624__	1.44	Cape May		☆				☆						2	0	0	0
17000624__	1.63	Atlantic	☆					☆						2	0	0	0
17000624__	2.58	Cape May	☆	☆										2	2	1	0
17000625__	1.28	Cape May	☆					☆						2	0	0	0
17000639__	1.98	Cape May	☆	☆										2	0	0	0
17000639__	3.35	Cape May	☆	☆										2	1	0	0
17000639__	4.48	Cape May	☆	☆										2	0	0	0
17000643__	3.24	Cape May		☆			☆							2	0	0	0
17000644__	2.98	Cape May	☆			☆								2	0	0	0
17000644__	3.73	Cape May	☆			☆								2	1	1	0
17000644__	4.04	Salem		☆		☆								2	0	0	0
17000648__	5.39	Salem		☆				☆						2	0	0	0
17000657__	4.8	Atlantic	☆		☆									2	1	0	0
17000658__	8.65	Cape May	☆			☆								2	0	0	0
17000667__	2.57	Salem	☆	☆										2	0	0	0
17000672__	7.35	Atlantic	☆		☆									2	2	0	0
00000551__	6.92	Atlantic					☆				☆			1.5	0	0	0
00000551__	7.15	Atlantic					☆				☆			1.5	0	0	0
00000553__	16.03	Atlantic			☆						☆			1.5	2	0	0
00000553__	5.18	Cape May		☆							☆			1.5	1	0	0
00000553__	5.38	Cape May		☆							☆			1.5	0	0	0
00000553__	5.55	Cape May		☆							☆			1.5	0	0	0
00000553__	9.04	Atlantic						☆			☆			1.5	0	0	0
00000559__	1.71	Cape May				☆					☆			1.5	0	0	0
00000559__	10.42	Atlantic					☆			☆				1.5	0	0	0
00000559__	16.73	Cape May		☆						☆				1.5	0	0	0
00000559__	2.21	Cape May	☆								☆			1.5	2	0	0
00000559__	3.92	Atlantic	☆								☆			1.5	0	0	0

SJTPO Curves
Risk Factor Scoring Table

SITPO Curve			Primary Risk Factor										Crash History				
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge Risk 2C	Super-elevation 3% or 4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
00000559__	4.71	Atlantic	☆								☆			1.5	1	0	0
00000559__	4.76	Cape May		☆							☆			1.5	0	0	0
00000559A__	6.04	Atlantic						☆			☆			1.5	1	0	0
00000559A__	7.31	Atlantic						☆			☆			1.5	1	1	0
00000561__	17.24	Atlantic				☆					☆			1.5	0	0	0
00000561A__	5.05	Atlantic				☆					☆			1.5	1	0	0
00000561A_X100660	0.02	Atlantic				☆						☆		1.5	0	0	0
00000563__	1.28	Atlantic					☆				☆			1.5	0	0	0
00000575__	15.13	Cape May	☆								☆			1.5	2	1	0
00000575__	2.17	Atlantic	☆								☆			1.5	0	0	0
00000581__	8.06	Atlantic						☆					☆	1.5	0	0	0
01000601__	0.02	Atlantic			☆					☆				1.5	2	0	0
01000615__	6.26	Atlantic	☆								☆			1.5	0	0	0
01000651__	10.82	Cape May				☆					☆			1.5	0	0	0
01000651__	5.38	Atlantic	☆								☆			1.5	3	2	0
01000655__	0.11	Atlantic						☆			☆			1.5	0	0	0
01000685__	0.53	Cape May						☆			☆			1.5	0	0	0
01000685__	0.81	Cape May	☆								☆			1.5	0	0	0
01000724__	0.63	Atlantic	☆								☆			1.5	0	0	0
01021049__	0.12	Atlantic			☆					☆				1.5	0	0	0
01021050__	0.01	Atlantic			☆					☆				1.5	0	0	0
01081686__	0.59	Atlantic					☆				☆			1.5	0	0	0
01081686__	1.19	Atlantic			☆						☆			1.5	0	0	0
01111139__	2.21	Atlantic				☆						☆		1.5	0	0	0
05000610__	2.37	Cape May	☆										☆	1.5	0	0	0
05000610__	7.63	Cape May	☆									☆		1.5	0	0	0
05000619__	1.6	Atlantic					☆				☆			1.5	0	0	0
05000626__	5.57	Salem	☆										☆	1.5	0	0	0
05000638__	2.65	Atlantic	☆										☆	1.5	0	0	0
05000656__	0.96	Atlantic								☆	☆			1.5	0	0	0
05071025__	0.4	Atlantic	☆							☆				1.5	0	0	0
06000608__	0.02	Atlantic			☆						☆			1.5	0	0	0
06000627__	0.8	Atlantic					☆				☆			1.5	2	1	0
06000649__	4.01	Atlantic				☆					☆			1.5	0	0	0
06000670__	13.42	Atlantic	☆								☆			1.5	2	1	0
06101007__	1.57	Atlantic					☆			☆				1.5	0	0	0
17000602__	2.47	Atlantic	☆										☆	1.5	0	0	0
00000540__				☆										1	2	0	0
00000540__	12.28	Cape May				☆								1	1	1	0
00000540__	12.65	Atlantic												1	0	0	0
00000540__	17.93	Cape May	☆											1	0	0	0
00000540__	25.88	Atlantic	☆											1	0	0	0
00000540__	25.92	Atlantic	☆											1	6	2	0
00000540__	26.37	Salem		☆										1	0	0	0
00000540__	28.07	Salem		☆										1	1	0	0
00000540__	28.1	Salem		☆										1	0	0	0
00000540__	28.27	Salem		☆										1	1	0	0
00000540__	5.98	Atlantic					☆							1	1	0	0
00000548__	1.36	Cape May		☆										1	0	0	0

SJTPO Curves
Risk Factor Scoring Table

SITPO Curve			Primary Risk Factor										Crash History				
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge Risk 2C	Super-elevation 3%-4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
00000548__	3.68	Cape May		☆										1	0	0	0
00000548__	7.96	Atlantic					☆							1	2	2	0
00000548__	8.26	Atlantic					☆							1	0	0	0
00000550__	13.78	Atlantic					☆							1	0	0	0
00000550__	3.02	Atlantic		☆										1	7	2	0
00000550__	7.45	Cape May					☆							1	0	0	0
00000551__	8.56	Salem		☆										1	0	0	0
00000555__	2.43	Atlantic	☆											1	0	0	0
00000557__	14.68	Salem		☆										1	0	0	0
00000557__	4.95	Cumberland		☆										1	0	0	0
00000557__	6.92	Atlantic					☆							1	0	0	0
00000559__	10.29	Atlantic						☆						1	0	0	0
00000559__	19.73	Atlantic	☆											1	0	0	0
00000559__	23.38	Cumberland		☆										1	0	0	0
00000559__	23.66	Atlantic			☆									1	0	0	0
00000559__	23.99	Atlantic			☆									1	0	0	0
00000559__	29.85	Cumberland				☆								1	0	0	0
00000559__	30.39	Atlantic			☆									1	0	0	0
00000559__	5.27	Atlantic	☆											1	1	1	0
00000559__	5.31	Atlantic					☆							1	0	0	0
00000559__	7.64	Atlantic	☆											1	3	2	0
00000559__	7.9	Cumberland		☆										1	0	0	0
00000559__	8.61	Cumberland		☆					☆					1	0	0	0
00000559__	9.73	Atlantic												1	0	0	0
00000561__	23.57	Cumberland				☆								1	1	1	0
00000561A__	7.64	Atlantic				☆								1	0	0	0
00000561A__	9.33	Atlantic				☆								1	0	0	0
00000563__	20	Atlantic			☆									1	1	0	0
00000563__	20.29	Atlantic			☆									1	1	0	0
00000563__	21.06	Atlantic			☆									1	0	0	0
00000563__	22.12	Atlantic				☆								1	0	0	0
00000563__	22.93	Atlantic				☆								1	1	1	0
00000575__	17.82	Atlantic	☆											1	1	0	0
00000575__	18.13	Atlantic	☆											1	0	0	0
00000575__	18.5	Atlantic	☆											1	1	0	0
00000575__	18.82	Cumberland	☆											1	0	0	0
00000575__	19.91	Atlantic				☆								1	1	1	0
00000575__	20.57	Atlantic				☆								1	1	1	0
00000581__	0.24	Atlantic					☆							1	1	0	0
00000581__	4.66	Salem		☆										1	0	0	0
00000581__	5.12	Cumberland		☆										1	1	0	0
00000581__	9.96	Cumberland						☆						1	0	0	0
01000610__	1.04	Atlantic	☆											1	0	0	0
01000610__	1.79	Atlantic			☆									1	0	0	0
01000613__	2.12	Atlantic				☆								1	0	0	0
01000613__	2.61	Cumberland				☆								1	1	1	0
01000615__	1.37	Atlantic				☆								1	0	0	0
01000615__	1.65	Atlantic				☆								1	1	1	0

SJTPO Curves
Risk Factor Scoring Table

SITPO Curve			Primary Risk Factor										Crash History				
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge Risk 2C	Super-elevation 3%-4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
01000623	1.44	Atlantic	☆											1	0	0	0
01000623	5.02	Atlantic	☆											1	0	0	0
01000623	6.28	Atlantic				☆								1	3	3	0
01000643	0.13	Atlantic	☆											1	0	0	0
01000643	0.28	Atlantic	☆											1	0	0	0
01000643	2.43	Atlantic												1	0	0	0
01000643	2.71	Atlantic				☆								1	0	0	0
01000643	2.96	Atlantic				☆								1	0	0	0
01000643	3.42	Atlantic				☆								1	0	0	0
01000643	3.66	Atlantic				☆								1	0	0	0
01000647	0.68	Atlantic	☆											1	1	0	0
01000647	0.97	Atlantic	☆											1	0	0	0
01000647	2.62	Atlantic			☆									1	1	0	0
01000651	1.54	Atlantic	☆											1	0	0	0
01000651	2.06	Atlantic				☆								1	0	0	0
01000651	2.77	Atlantic				☆								1	0	0	0
01000658	4.15	Salem		☆										1	0	0	0
01000662	0.12	Atlantic				☆								1	0	0	0
01000662	0.38	Cumberland				☆								1	0	0	0
01000663	0.4	Atlantic			☆									1	0	0	0
01000666	1.03	Cumberland		☆										1	1	1	0
01000669	5.93	Cumberland		☆										1	1	0	0
01000670	0.39	Atlantic	☆											1	1	0	0
00000563	13.39	Cumberland	☆											1	0	0	0
01000684	0.55	Cumberland				☆								1	0	0	0
01000684	0.8	Atlantic				☆								1	0	0	0
01000684	0.93	Cumberland				☆								1	0	0	0
01000684	1.11	Atlantic				☆								1	0	0	0
01000684	1.44	Atlantic				☆								1	15	3	0
01000687	1.17	Atlantic				☆								1	0	0	0
01041038	0.22	Atlantic			☆									1	0	0	0
01041038	0.91	Atlantic	☆											1	0	0	0
01081117	0.46	Cumberland	☆											1	0	0	0
01081117	0.54	Cumberland	☆											1	0	0	0
01081117	1.39	Atlantic			☆									1	0	0	0
01081117	1.99	Atlantic	☆											1	0	0	0
01081117	2.14	Atlantic	☆											1	0	0	0
01081359	0.21	Atlantic			☆									1	1	1	0
01101009	0.27	Cumberland						☆						1	0	0	0
01101009	0.4	Cumberland						☆						1	0	0	0
01121291	5.49	Cumberland				☆								1	0	0	0
05000608	0.11	Atlantic						☆						1	0	0	0
05000610	1.97	Cumberland		☆										1	0	0	0
05000610	2.06	Cumberland					☆							1	1	0	0
05000610	4.98	Cape May	☆											1	1	1	0
05000610	6.92	Cape May	☆											1	0	0	0
05000612	0.64	Cumberland				☆								1	0	0	0
05000615	4.13	Cape May	☆											1	0	0	0

SITPO Curves
Risk Factor Scoring Table

SITPO Curve			Primary Risk Factor										Crash History				
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater and Edge Risk 2C	Super-elevation 3%-4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater and Edge Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
05000615	4.65	Cape May	☆											1	1	0	0
05000618	2.5	Cumberland					☆							1	3	2	0
05000626	3.5	Cumberland					☆							1	1	0	0
05000626	3.71	Cumberland					☆							1	0	0	0
05000626	4.47	Cumberland					☆							1	2	1	0
05000626	5.04	Cape May					☆							1	2	0	0
05000628	1.02	Cape May					☆							1	3	0	0
05000628	1.67	Cumberland					☆							1	0	0	0
05000628	2.18	Cumberland					☆							1	0	0	0
05000629	0.01	Cape May			☆									1	0	0	0
05000638	2.31	Cape May			☆									1	2	0	0
05000654	0.46	Cape May	☆											1	2	0	0
05000654	1.19	Cape May					☆							1	0	0	0
06000616	0.56	Cape May				☆								1	0	0	0
06000616	1.98	Cape May			☆									1	0	0	0
06000616	2.16	Cape May	☆											1	0	0	0
06000616	2.66	Cape May				☆								1	1	0	0
06000616		Cumberland				☆								1	0	0	0
06000616	3.01	Cape May				☆								1	1	0	0
06000616	3.09	Cape May				☆								1	0	0	0
06000616	4.65	Cape May				☆								1	0	0	0
06000616	6.78	Cape May				☆								1	0	0	0
06000616	6.88	Cape May				☆								1	0	0	0
06000616	6.99	Salem				☆								1	0	0	0
06000616	7.15	Salem				☆								1	0	0	0
17000601	3.41	Salem		☆										1	1	0	0
17000601	4.81	Salem		☆										1	0	0	0
17000602	3.3	Salem		☆										1	1	0	0
17000604	3.06	Salem	☆											1	0	0	0
17000611	0.74	Salem	☆											1	0	0	0
17000611	1.64	Cape May					☆							1	1	0	0
17000611	2.42	Cape May					☆							1	0	0	0
17000611	2.77	Cape May					☆							1	0	0	0
17000611	3.04	Cape May					☆							1	0	0	0
17000620	1.02	Salem		☆										1	0	0	0
17000620	1.69	Cape May	☆											1	0	0	0
17000620	4.99	Salem		☆										1	0	0	0
17000620	5.65	Salem						☆						1	2	1	0
17000623	6.37	Salem		☆										1	0	0	0
17000623	7.52	Salem		☆										1	0	0	0
17000624	0.04	Cape May	☆											1	0	0	0
17000624	0.3	Salem						☆						1	0	0	0
17000624	2.03	Salem		☆										1	0	0	0
17000625	0.68	Salem		☆										1	0	0	0
17000625	0.93	Salem	☆											1	0	0	0
17000625	1.03	Cape May	☆											1	0	0	0
17000625	1.93	Salem						☆						1	0	0	0
17000625	2.38	Salem						☆						1	0	0	0

SJTPO Curves
Risk Factor Scoring Table

SITPO Curve			Primary Risk Factor										Crash History				
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge and Risk 2C	Super-elevation 3%-4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge and Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
17000626	2.6	Salem		☆										1	0	0	0
17000626	3.99	Salem						☆						1	0	0	0
17000639	2.85	Salem		☆										1	1	0	0
17000639	5.47	Cape May			☆									1	0	0	0
17000641	0.77	Cape May						☆						1	1	1	0
17000642	0.64	Salem	☆											1	0	0	0
17000642	2.22	Cape May			☆									1	0	0	0
17000644	0.08	Salem				☆								1	0	0	0
17000644	1.01	Salem				☆								1	1	0	0
17000644	1.4	Salem												1	1	0	0
17000644	2.01	Salem				☆								1	0	0	0
17000644	2.63	Salem				☆								1	0	0	0
17000648	3.1	Cape May	☆											1	0	0	0
17000648	3.26	Salem						☆						1	1	0	0
17000657	1.33	Salem	☆											1	2	1	0
17000657	3.02	Cape May	☆											1	0	0	0
17000657	5.76	Salem	☆											1	0	0	0
17000657	6.04	Salem						☆						1	1	0	0
17000657	6.06	Salem							☆					1	1	1	1
17000658	9.89	Cape May			☆									1	0	0	0
17000667	1.1	Salem		☆										1	0	0	0
17000667	2.93	Salem		☆										1	0	0	0
17000667	3.5	Salem		☆										1	1	1	0
17000667	3.73	Salem		☆										1	1	0	0
17000667	4.48	Salem		☆										1	1	0	0
17000672	2.25	Salem		☆										1	0	0	0
17000672	6.36	Cape May	☆											1	0	0	0
00000553	12.1	Cape May									☆			0.5	3	1	0
00000553	18.9	Cape May									☆			0.5	0	0	0
00000553	22.23	Cape May									☆			0.5	0	0	0
00000553	23.47	Cape May									☆			0.5	2	0	0
00000553	3.96	Salem									☆			0.5	1	1	0
00000555	8.64	Salem									☆			0.5	0	0	0
00000559	14.02	Cape May									☆			0.5	0	0	0
00000559	18.83	Cape May								☆				0.5	0	0	0
00000559	4.19	Cape May									☆			0.5	0	0	0
00000559A	7.02	Cape May									☆			0.5	1	0	0
00000559A	8.35	Cape May									☆			0.5	0	0	0
00000563	1.69	Cape May									☆			0.5	0	0	0
00000575	14.63	Salem									☆			0.5	0	0	0
01000646	7.3	Cape May									☆			0.5	4	2	0
01000651	5.75	Cape May									☆			0.5	1	0	0
01000663	1.1	Cape May								☆				0.5	0	0	0
01000663	1.23	Cape May								☆				0.5	0	0	0
05000615	2.92	Cape May											☆	0.5	0	0	0
05000615	3.03	Cape May											☆	0.5	0	0	0
05000615	3.15	Cape May											☆	0.5	0	0	0
05000618	2.72	Cumberland											☆	0.5	0	0	0

SJTPO Curves
Risk Factor Scoring Table

SITPO Curve			Primary Risk Factor								Crash History						
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge Risk 2C	Super-elevation 3%-4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Funtional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
05000626__	5.41	Cape May											☆	0.5	0	0	0
05000654__	1.5	Cape May											☆	0.5	2	1	0
06000671__	3.57	Salem									☆			0.5	0	0	0
00000540__	14.23	Cape May												0	0	0	0
00000540__	14.72	Cape May												0	0	0	0
00000540__	17.61	Salem												0	0	0	0
00000540__	25.57	Cape May												0	1	1	0
00000540__	27.58	Salem												0	0	0	0
00000548__	8.58	Cape May												0	0	0	0
00000550__	0.52	Cape May												0	1	1	0
00000550__	0.53	Salem												0	0	0	0
00000555__	0.27	Cape May												0	0	0	0
00000555__	0.9	Cape May												0	0	0	0
00000555__	1.57	Cape May												0	0	0	0
00000555__	1.67	Salem												0	0	0	0
00000555__	2	Salem												0	3	2	0
00000555__	2.38	Cape May												0	1	1	0
00000557__	4.28	Cape May												0	0	0	0
00000559__	20.21	Cumberland												0	1	0	0
00000559__	21.51	Salem												0	0	0	0
00000559__	21.92	Salem												0	0	0	0
00000559__	22.29	Cumberland												0	0	0	0
00000559__	23.77	Salem												0	0	0	0
00000559__	24.22	Cumberland												0	0	0	0
00000559__	28.26	Cumberland												0	0	0	0
00000559__	8.77	Cumberland												0	0	0	0
00000559__	9.46	Cumberland												0	0	0	0
00000559__	9.87	Cumberland												0	0	0	0
00000581__	3.77	Salem												0	0	0	0
00000581__	3.91	Salem												0	0	0	0
00000581__	7.04	Salem												0	0	0	0
00000581__	9.73	Salem												0	0	0	0
01000610__	0.78	Cumberland												0	0	0	0
01000623__	10.18	Cumberland												0	0	0	0
01000623__	4.92	Salem												0	1	0	0
01000647__	0.54	Salem												0	0	0	0
01000647__	1.38	Salem												0	0	0	0
01000652__	0.38	Cumberland												0	0	0	0
01000658__	2.51	Salem												0	0	0	0
01000658__	3.48	Salem												0	0	0	0
01000658__	3.59	Cumberland												0	0	0	0
01000658__	4.63	Salem												0	0	0	0
01000666__	0.34	Cumberland												0	0	0	0
01000666__	2.14	Cumberland												0	0	0	0
01000666__	2.71	Salem												0	0	0	0
01000666__	3.45	Salem												0	0	0	0
01000666__	3.58	Cumberland												0	0	0	0
01000666__	3.65	Salem												0	0	0	0

SJTPO Curves
Risk Factor Scoring Table

SITPO Curve			Primary Risk Factor								Crash History						
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge Risk 2C	Super-elevation 3%-4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
01000666__	7.85	Salem												0	0	0	0
01000666__	7.97	Salem												0	0	0	0
01000690__	1.56	Cumberland												0	0	0	0
01041038__	0.17	Cumberland												0	0	0	0
01081117__	0.88	Cumberland												0	0	0	0
01081359__	0.09	Cumberland												0	0	0	0
05000615__	3.44	Salem												0	0	0	0
05000615__	3.88	Salem												0	0	0	0
05000615__	4.69	Salem												0	0	0	0
05000615__	4.81	Cumberland												0	0	0	0
05000644__	1.49	Cumberland												0	0	0	0
06000634__	2.16	Salem												0	0	0	0
06000634__	2.29	Salem												0	0	0	0
06000634__	2.66	Salem												0	1	0	0
06000690__	1.67	Salem												0	0	0	0
06000690__	1.83	Salem												0	0	0	0
06000690__	2.29	Salem												0	0	0	0
06000710__	0.62	Salem												0	1	1	0
17000604__	3.24	Salem												0	0	0	0
17000611__	2.89	Salem												0	0	0	0
17000611__	3.26	Salem												0	1	0	0
17000620__	5.2	Salem												0	1	0	0
17000620__	5.46	Salem												0	0	0	0
17000623__	7.02	Salem												0	0	0	0
17000623__	7.27	Salem												0	0	0	0
17000623__	7.54	Salem												0	0	0	0
17000624__	2.67	Salem												0	0	0	0
17000624__	3.28	Salem												0	0	0	0
17000624__	3.46	Salem												0	0	0	0
17000624__	3.57	Salem												0	0	0	0
17000625__	2.67	Salem												0	0	0	0
17000626__	3.29	Salem												0	0	0	0
17000635__	2.11	Salem												0	0	0	0
17000643__	0.25	Salem												0	0	0	0
17000648__	5.15	Salem												0	0	0	0
17000657__	2.89	Salem												0	0	0	0
17000657__	4.15	Salem												0	0	0	0
17000657__	4.37	Salem												0	0	0	0
17000657__	4.62	Salem												0	0	0	0
17000657__	5.92	Salem												0	0	0	0
17000658__	5.82	Salem												0	0	0	0
17000658__ C100500	6.49	Salem												0	1	0	0
17000667__	1.4	Salem												0	0	0	0
17000667__	1.93	Salem												0	0	0	0
17000667__	2.21	Salem												0	0	0	0
17000667__	3.27	Salem												0	0	0	0
17000667__	4.15	Salem												0	0	0	0

**SJTPO Curves
Risk Factor Scoring Table**

STPO Curve		Primary Risk Factor										Crash History					
State Route Identifier	Mile Post Begin	County	Adjacent Intersection Present	Curve Length 500-800 Feet	Lane Width 12 Feet and Greater & Curve Radius 1,000 Feet and Less	Posted Speed 40 or 45 MPH	Shoulder Width 5.5 Feet or Greater & Edge Risk 2C	Super-elevation 3%-4%	Presence of KA Crash	Urban Area Type	Other Principal Arterial Functional Class	Median Present	Shoulder Width 5.5 Feet or Greater & Edge Risk 1	Total Risk Score	Total Lane Departure (KABCO)	Injury Lane Departure (KABC)	Fatal and Severe Injury Lane Departure (KA)
17000672__	6.4	Salem												0	0	0	0

Attachment D

Countermeasure Selection Memorandum

Countermeasure Identification and Selection

PREPARED FOR: NJDOT
COPY TO: File
DATE: October 25, 2019
REVISION NO.: Rev. 1, April 17, 2020

Introduction

Traffic safety countermeasures broadly include roadway treatments, educational outreach, and law enforcement efforts designed to reduce the frequency and/or severity of specific crash types. Countermeasure identification and selection for the systemic safety analysis of County and Municipal curves in the Delaware Valley Regional Planning Commission (DVRPC) and South Jersey Transportation Planning Organization (SJTPO) regions focused specifically on roadway treatments applied to curves. Countermeasures are selected with the goal of future project development. The development of effective systemic application of projects and treatments requires the selection of countermeasures that are proven to be effective, feasible to implement, and applicable to the study sites. The purpose of this memo is to document:

- The method by which countermeasures were initially identified
- Pertinent countermeasure information including effectiveness and planning level costs
- Countermeasure screening criteria
- Final selection of countermeasures.

The countermeasures identified in this document were developed to address the risk factors previously identified in the DVRPC/SJTPO Region, County and Municipal Routes Horizontal Curve Risk Factor Analysis and Identification Memos.

Countermeasure Identification

A key aspect of countermeasure identification is proven effectiveness. The initial list of potential countermeasures was developed from reliable national publications and programs to ensure that potential projects will be likely to reduce roadway departure crashes at curves. Countermeasures were initially identified from the following sources:

- **Federal Highway Administration (FHWA) Office of Safety Proven Safety Countermeasures** – This list of twenty countermeasures contains treatments and strategies stakeholders should strongly consider to reduce roadway departure, intersection, pedestrian, and bicycle crashes. For more information, see <https://safety.fhwa.dot.gov/provencountermeasures/>.

- **National Cooperative Highway Research Program (NCHRP) Report 500** – This series of guides was developed to assist state and local agencies in reducing injuries and fatalities in targeted areas. The guides correspond to the emphasis areas outlined in the AASHTO Strategic Highway Safety Plan. For more information, see <http://www.trb.org/Main/Blurbs/152868.aspx>.
- **FHWA Every Day Counts (EDC)** – EDC is a State-based model that identifies and rapidly deploys proven, yet underutilized innovations to shorten the project delivery process, enhance roadway safety, reduce traffic congestion, and integrate automation. Proven innovations promoted through EDC facilitate greater efficiency at the State and local levels, saving time, money and resources that can be used to deliver more projects. For more information, see <https://www.fhwa.dot.gov/innovation/everydaycounts/>.
- **FHWA Roadway Safety Professional Capacity Building Community of Practice** – The FHWA Office of Safety’s Roadway Safety Professional Capacity Building Program (RSPCB) provides resources to help safety experts and specialists develop critical knowledge and skills within the roadway safety workforce. The RSPCB highlights noteworthy practices from stakeholders around the country. For more information, see <https://rspcb.safety.fhwa.dot.gov/Default.aspx>.
- **Crash Modification Factors (CMF) Clearinghouse** – CMFs are a measure of countermeasure effectiveness that allow for estimation of crash reduction. The CMF Clearinghouse provides a source for CMFs developed and rated by the transportation safety community. The CMF clearinghouse provides information on the reliability and applicability of CMFs (and therefore countermeasures) as well as information on developing, selecting, and using CMFs. For more information, see <http://www.cmfclearinghouse.org/>. The CMF clearinghouse also provides planning-level cost estimates for various treatments and countermeasures. For more information on cost information, see http://www.cmfclearinghouse.org/resources_analysis.cfm.

In addition to these sources, the project team also considered input from state, local, and regional stakeholders to establish a comprehensive list of potential countermeasures. Countermeasures are broadly broken down by cost (low, medium, and high) and implementation time (short-term, medium-term, and long-term). During the program and project development steps of the systemic analysis process, preference is usually given to low cost, short-term projects as they can be quickly implemented across the study network. Cost and time criteria of projects are based on research and accepted community of practice designations and do not refer to specific monetary or time thresholds. Table 1 contains the initial list of countermeasures for consideration.

Table 1 Low Cost/ Short-Term Countermeasures

Countermeasure	Crash Reduction	Unit Cost ¹	CMF ID	Study Links	Additional Sources / Information ²
Advanced Curve Warning Signs	30% ABC injury crashes (CMF 71) 8% PDO injury crashes (CMF 72)	\$450 / Curve	71, 72	http://www.cmfclearinghouse.org/detail.cfm?facid=71 http://www.cmfclearinghouse.org/detail.cfm?facid=72	Note, this treatment installed has been found to be even more effective when combined with chevron alignment signs and/or sequential flashing beacons. (CMF 1851) Advanced Warning Sign Cost based on ITEM: 612003-REGULATORY AND WARNING SIGN (W1-2 type) Two advance signs per curve. (one sign in each approaching direction).
Advanced Curve Warning Signs with Advisory Speed Sign/Plaque	29% all crashes 13% injury crashes	\$740 / Curve Includes: \$450 / Curve for Advanced Warning \$290 / Curve for Advisory Speed Plaque	N/A	Bahar, Parkhill, Hauer, Council, Persaud, Zegeer, Elvik, Smiley, and Scott. Prepare Parts I and II of a Highway Safety Manual: <i>Knowledge Base for Part II</i> . NCHRP Project 17-27. (May 2007) Gan, Shen, and Rodriguez. <i>Update of Florida Crash Reduction Factors and Countermeasures to Improve the Development of District Safety Improvement Projects</i> . Florida DOT, (2005) https://safety.fhwa.dot.gov/tools/crf/resources/briefs/rdwypartissue.pdf http://www.cmfclearinghouse.org/detail.cfm?facid=87	Speed Advisory Plaque Cost based on ITEM: 612003-REGULATORY AND WARNING SIGN (W1-2 & W13-1P types) Two plaques per curve. (one plaque in each approaching direction).
Centerline Pavement Markings (4” Stripe)	1% ABC injury crashes (CMF 87)	\$0.66 / LF	87	http://www.cmfclearinghouse.org/detail.cfm?facid=87	Costs based on ITEM: 610003-TRAFFIC STRIPES, 4" (assume solid double yellow)
Centerline Rumble Strips	13-51% single vehicle run-off-road fatal and injury crashes 3% all crashes on curves (CMF 9686)	\$0.37 / LF	9686	https://safety.fhwa.dot.gov/provencountermeasure/s/long_rumble_strip/ http://www.cmfclearinghouse.org/detail.cfm?facid=9686	Costs based on ITEM: 610033-RUMBLE STRIP
Chevron Alignment Signs	28-35% all crashes (CMF 7268)	\$180 / Chevron Sign	7268	http://www.cmfclearinghouse.org/detail.cfm?facid=7268 https://safety.fhwa.dot.gov/tools/crf/resources/briefs/rdwypartissue.pdf	Note, this treatment installed has been found to be even more effective when combined with curve warning and/or sequential flashing beacons. (CMF 1851) Costs based on ITEM: 612003-REGULATORY AND WARNING SIGN (W1-8 type) Spacing and number are dependent upon curve radius
Converging Chevron Pavement Markings	38% all crashes 32% all crashes, urban areas (CMF 112)	\$66 / Chevron Marking	112	https://safety.fhwa.dot.gov/tools/crf/resources/briefs/rdwypartissue.pdf http://www.cmfclearinghouse.org/detail.cfm?facid=112	Costs based on ITEM: ITEM : 610017-TRAFFIC MARKING LINES, 24" (assume 12’ lane width with average length of 13’ for skew) Note: This pattern is not MUTCD compliant and requires FHWA experimental permission.
Edgeline Pavement Markings (4” Stripe)	28% all crashes, rural curves (CMF 1942) 11% run off road crashes, urban curves (CMF 1945)	\$0.33 / LF one edge; 0.66 / LF both edges	1942, 1945	http://www.cmfclearinghouse.org/detail.cfm?facid=1942 http://www.cmfclearinghouse.org/detail.cfm?facid=1945	Costs based on ITEM: 610003-TRAFFIC STRIPES, 4"
Edgeline Rumble Strips	13-51% single vehicle run-off-road fatal and injury crashes 25% all crashes, rural curves (CMF 9830)	\$0.37 / LF one edge; 0.74 / LF both edges	9830	https://safety.fhwa.dot.gov/provencountermeasure/s/long_rumble_strip/ http://www.cmfclearinghouse.org/detail.cfm?facid=9830	Costs based on ITEM: 610033-RUMBLE STRIP and ITEM: 610003-TRAFFIC STRIPES, 4"

Notes: 1. Unless otherwise noted, costs determined from average bid item costs found at <https://www.state.nj.us/transportation/business/aashtoware/pdf/report2019.pdf>.
2. The CMF Clearinghouse Synthesis of Countermeasure Cost SOCC Summary Table can be found at http://www.cmfclearinghouse.org/collateral/SOCC_SummaryTables.xlsx

Table 1 Low Cost/ Short-Term Countermeasures (continued)

Countermeasure	Crash Reduction	Unit Cost ¹	CMF ID	Study Links	Additional Sources / Information ²
Enhanced (Wider) Pavement Markings	37% KABC crashes, rural roads, 4" to 6" (CMF 4737) 38% KABC crashes, rural roads, 4" to 5" (CMF 4751)	\$0.74 / LF one edge; 1.48 / LF both edges	4737 , 4751	http://www.cmfclearinghouse.org/detail.cfm?facid=4737 http://www.cmfclearinghouse.org/detail.cfm?facid=4751	Hall. <i>Evaluation of Wide Edge Lines</i> . In Transportation Research Record No. 1114, Transportation Research Board of the National Academies, Washington, D.C., 1987, pp. 21-27. Cottrell. <i>Evaluation of Wide Edge Lines on Two-Lane Rural Roads</i> . Publication FHWA-VA-85-37. Virginia Highway and Transportation Research Council, Virginia Department of Transportation, Richmond, Virginia, 1987. Hughes, McGee, Hussain, and Keegel. <i>Field Evaluation of Edge Line Widths</i> . Publication FHWA-89-111. Federal Highway Administration, United States Department of Transportation, Washington, D.C., 1989. Costs based on ITEM: 61008M- TRAFFIC STRIPES, 8"
Flashing beacons in combination with curve warning signs and chevrons	37-76% various crashes 47.6% all crashes (CMF 1914)	\$ 4,158 / Beacon \$ 180 / Chevron sign	1914	https://safety.fhwa.dot.gov/roadway_dept/countermeasures/horiculture/fhwasa15084/ch4.cfm#ch4a http://www.cmfclearinghouse.org/detail.cfm?facid=1914	Costs based on ITEM: 702089 SOLAR FLASHING BEACON on Ped Standard/foundation with ITEM: 612003-REGULATORY AND WARNING SIGN (W1-2 type), and Chevrons (W1-8 type) with number and spacing dependent on curve radius
Obstacle Removal	38% all crashes (CMF 1024) 71% run-off road crashes	\$1000 Lump Sum	1024	http://www.cmfclearinghouse.org/detail.cfm?facid=1024	Gan, Shen, and Rodriguez, <i>Update of Florida Crash Reduction Factors and Countermeasures to Improve the Development of District Safety Improvement Projects</i> . Florida Department of Transportation, (2005) Costs assume removal of a large tree; costs are variable depending on obstacle
Post-Mounted / Roadside Delineation	15% run off road crashes, rural roads 10% KABC run off road crashes, rural roads	\$86 / Post Mounted Delineator	9727, 9728	http://www.cmfclearinghouse.org/detail.cfm?facid=9727 http://www.cmfclearinghouse.org/detail.cfm?facid=9728	Costs based on ITEM: 610030M-FLEXIBLE DELINEATOR, GROUND MOUNTED (spacing dependent on curve radius) Spacing is dependent on curve radius. Refer to NIDOT Standard Detail CD-610-4). In general, spacing = 3 x square root of (R-50); for curves with radius above 50'; for R=50' or less spacing is 20'. Maximum spacing of 300'.
Raised Pavement Markers	19% all crashes (CMF 5496)	\$28.74/ RPM mono-directional \$31.89 / RPM bi-directional	5496	http://www.cmfclearinghouse.org/detail.cfm?facid=5496	Costs based on ITEM: 610012M–RAISED PAVEMENT MARKERS (Mono-edge), & 610021M–RAISED PAVEMENT MARKERS (Bi-centerline) Typical spacing for a 2-lane road is 40' for curve radius ≤ 1,910' and 80' for radius > 1,910'). Refer to NIDOT Standard Detail 610-1 thru
Retroreflective Strip on Sign Post	No documentation to date of safety effects; statistically significant reduction in speeds.	\$40 / post	N/A	Hallmark, Hawkins, and Smadi. Evaluation of Low-Cost Treatments on Rural Two-Lane Curves. Report No. IHRB Project TR-579, Midwest Transportation Consortium, Iowa DOT and Iowa Highway Research Board, Ames, IA, 2012.	Iowa study indicated that the installation reduced mean and 85th percentile speeds along curves and statistically significant reduction in percentage of vehicles exceeding posted speed limit by more than 10 mph. Costs from Google search for materials with 25% factor for installation.
Speed Reduction Markings - optical speed bars, and/or in-lane words/markings	No crash reduction, for severe curve speed reduction	Optical Speed Bars: \$248 / curve Words in Lane: \$1,950 / curve	N/A	Design details and effectiveness on speeds is noted in: https://safety.fhwa.dot.gov/roadway_dept/countermeasures/horiculture/fhwasa15084/	Optical Speed Bar Costs based on ITEM: 610016-TRAFFIC MARKING LINES, 12" (2 12x12 speed marks at 20' spacing over average of 385 feet of markings approaching each side – correlates to worst case spacing for a 15 mph curve on 50 mph road) In Lane Speed Marking cost based on three words – ‘Curve’. ‘15’, and ‘MPH’; assumes 3 per direction, 6 in total.

Notes: 1. Unless otherwise noted, costs determined from average bid item costs found at <https://www.state.nj.us/transportation/business/aashtoware/pdf/report2019.pdf>.
2. The CMF Clearinghouse Synthesis of Countermeasure Cost SOCC Summary Table can be found at http://www.cmfclearinghouse.org/collateral/SOCC_SummaryTables.xlsx

Table 2 Medium Cost/ Mid-Term and High Cost/ Long-Term Countermeasures

Countermeasure	Crash Reduction	Unit Cost ¹	CMF ID	Study Links	Additional Sources / Information ²
Safety Edge	11% reduction in fatal and injury crashes 21% all crashes (CMF 9211)	\$ 71 / LF	9211	https://safety.fhwa.dot.gov/safetyEdge/fhwasa17044/index.cfm http://www.cmfclearinghouse.org/detail.cfm?facid=9211	https://safety.fhwa.dot.gov/roadway_dept/countermeasures/horicurves/fhwasa15084/ch5.cfm#ch5b Costs based on Item: 401054-HOT MIX ASPHALT 12.5 M 64 SURFACE COURSE (7" wide wedge) for one edge (outside priority) but can be applied to both sides.
Add/Widen Shoulders	9% all crashes 2% - 50% various crash types depending on existing shoulder and proposed shoulder width (ref. HSM) 23% all crashes, rural roads (CMF 6657)	\$153/ LF	6657	https://safety.fhwa.dot.gov/roadway_dept/countermeasures/horicurves/fhwasa15084/ch5.cfm#ch5b https://safety.fhwa.dot.gov/roadway_dept/countermeasures/horicurves/fhwasa15084/ch5.cfm#ch5b http://www.cmfclearinghouse.org/detail.cfm?facid=6657	Costs based on providing 6' of new shoulder (21" depth) and 4" striping Cost is for widening one side (outside priority) but can be applied to both sides.
Create Clear Zone	22% all crashes, rural areas, for improvement to 16.7 ft 44% all crashes, rural areas, for improvement from 16.7 to 30 ft	Varies	35, 36	http://www.cmfclearinghouse.org/detail.cfm?facid=35 http://www.cmfclearinghouse.org/detail.cfm?facid=36	https://safety.fhwa.dot.gov/provencountermeasures/roadside_design/ Costs variable depending on extent of clearing required
Curve Lighting	37% all crashes 28% ABC crashes (CMF 192)	Option 1: \$2,583/light Option 2: \$10,400/light plus \$10,500/curve	192	https://safety.fhwa.dot.gov/tools/crf/resources/briefs/rdwydepartissue.pdf http://www.cmfclearinghouse.org/detail.cfm?facid=192	https://safety.fhwa.dot.gov/tools/crf/resources/briefs/rdwydepartissue.pdf Costs based on ITEM: 703012-LIGHTING MAST ARM ALUMINUM and ITEM: 703018-LUMINAIRE (Option 1 - mounted on existing utility pole with service connected on pole, Option 2 - install new lighting pole(s) with one meter cabinet and service connection per curve)
Dynamic Curve Warning System	5% all crashes, rural roads with posted speed limit of 50-55 MPH	\$48,000 / Curve	6885	http://www.cmfclearinghouse.org/detail.cfm?facid=6885	https://safety.fhwa.dot.gov/roadway_dept/countermeasures/horicurves/fhwasa15084/ch4.cfm#ch4a Costs from CMF SOCC Summary Table - Based on "Install dynamic warning sign"
High Friction Surface Treatment (General)	17% all crashes 24% all crashes at curves (CMF 7900) 52% wet road crashes at curves (CMF 7901)	\$22.34 / SY	7900, 7901	https://safety.fhwa.dot.gov/tools/crf/resources/briefs/rdwydepartissue.pdf http://www.cmfclearinghouse.org/detail.cfm?facid=7900 http://www.cmfclearinghouse.org/detail.cfm?facid=7901	Costs based on ITEM: 423003-HIGH FRICTION SURFACE TREATMENT
Pavement Grooving	23% all crashes rural roads (CMF 7229)	\$11 / SF	7229	http://www.cmfclearinghouse.org/detail.cfm?facid=7229	Costs based on ITEM: 455003-DIAMOND GRINDING EXISTING CONCRETE PAVEMENT
Side Slope Flattening	Variable reduction, from 2.4% to 42% based on initial and final conditions	\$200,000 / Curve	6912, 26	http://www.cmfclearinghouse.org/detail.cfm?facid=6912 http://www.cmfclearinghouse.org/detail.cfm?facid=26	https://safety.fhwa.dot.gov/provencountermeasures/roadside_design/ Costs from CMF SOCC Summary Table; cost variable depending in site and exclude ROW Acquisition or Permit impacts.

Notes: 1. Unless otherwise noted, costs determined from average bid item costs found at <https://www.state.nj.us/transportation/business/aashtware/pdf/report2019.pdf>.
2. The CMF Clearinghouse Synthesis of Countermeasure Cost SOCC Summary Table can be found at http://www.cmfclearinghouse.org/collateral/SOCC_SummaryTables.xlsx

Countermeasure Screening

The initial list of countermeasures represents a broad list of potential treatments and strategies to reduce roadway departure crashes on County and Municipal curves in the DVRPC and SJTPO regions. Implementation of all the identified countermeasure treatments and strategies is not feasible due to budget and time constraints. Furthermore, certain treatments cannot be effectively and simultaneously implemented (i.e. high friction surface treatment and pavement grooving). As such, it is necessary for countermeasures to be screened to decide which treatments and strategies offer the most reasonable chance to reduce the frequency and severity of crashes. Countermeasures are screened based on the following criteria:

- Applicability – Does the countermeasure apply to roadway departure crashes on curves?
- Accuracy – Is the CMF reliable/does the backing study accurately relate to the site constraints?
- Cost – Does the unit cost prohibit extensive implementation across the study network?
- Implementation – Are there other barriers to implementing the countermeasure (i.e. political resistance, public perception, etc.)?
- History – Has the countermeasure been successfully deployed in a portion of the study network? Has the countermeasure already been systemically/systematically deployed? Have previous implementations of the countermeasures proven ineffective?

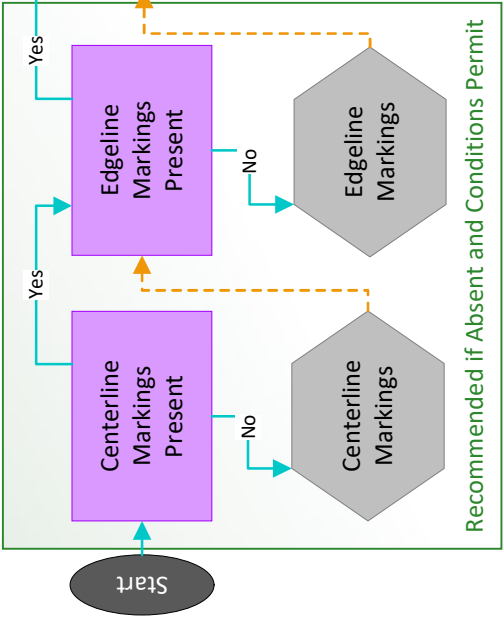
The final countermeasures are identified based on these criteria. These countermeasures will form the body of treatments and strategies that are developed into projects through the project development selection tree in the next steps of the systemic analysis project.

Final Countermeasure List

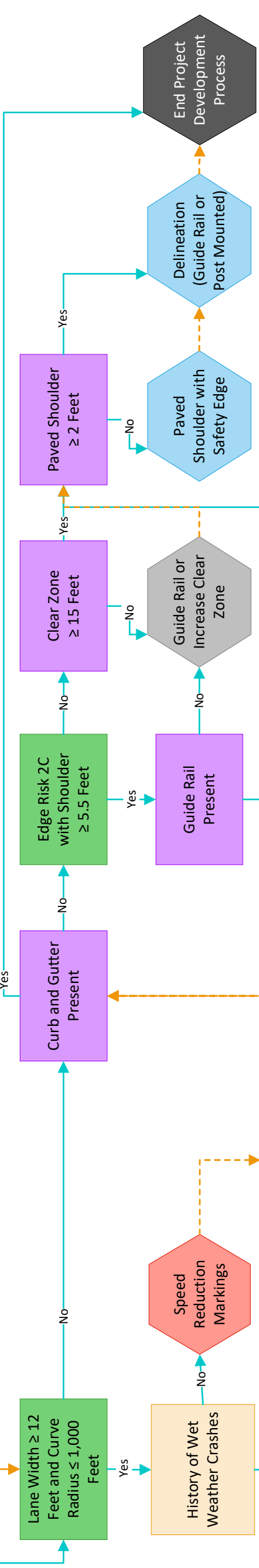
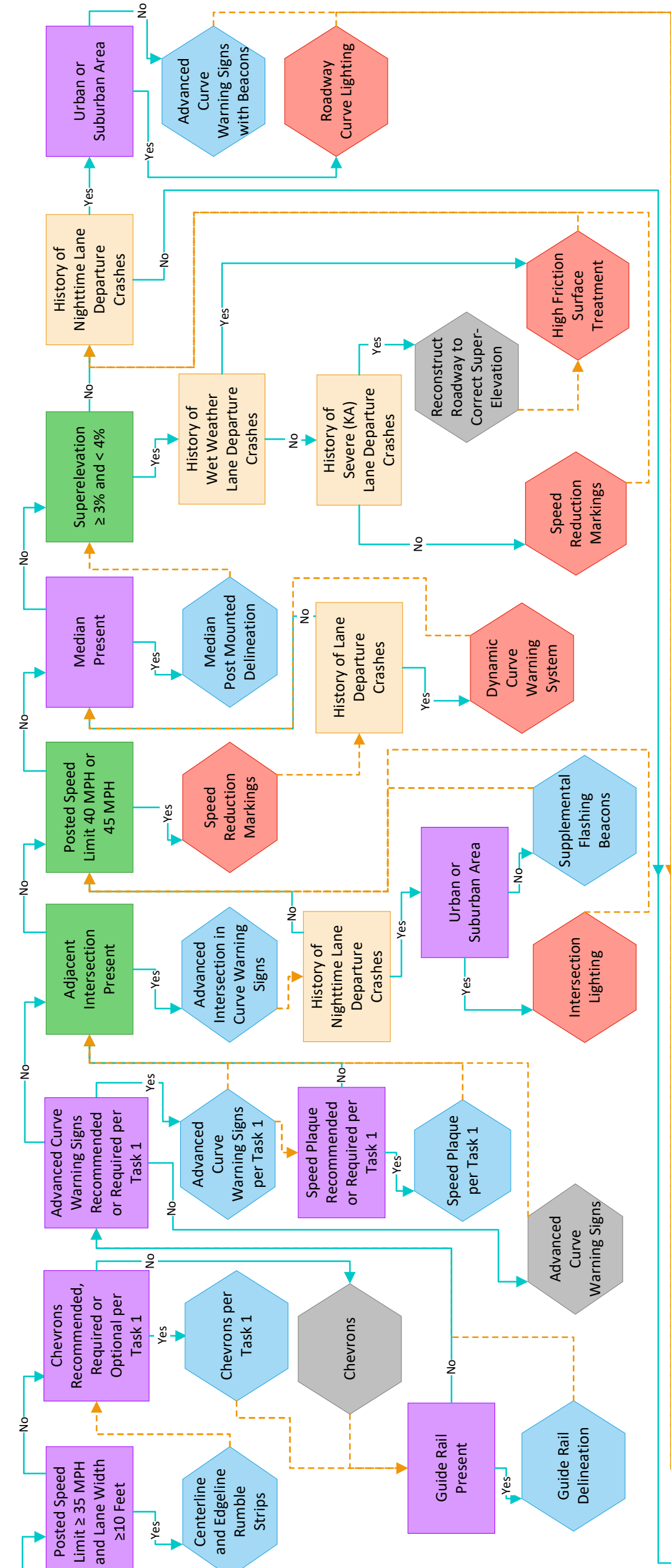
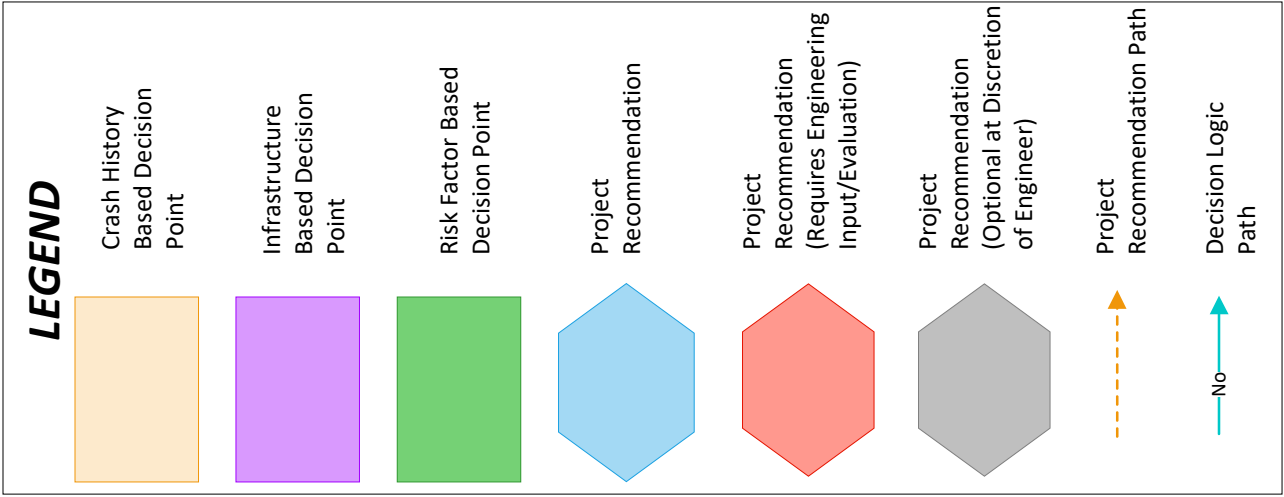
A meeting was held on July 19, 2019 with DVRPC and SJTPO to review the preliminary list of countermeasures for treating run off the road crashes at curves. Based on the feedback received, it was decided that all countermeasures with potential to reduce crashes should be included as options moving forward, provided they are applicable and offer safety benefits. The lists in Tables 1 and 2 were reviewed for applicability and updated with average historical installation costs based on applicable past projects in New Jersey.

Attachment E

Project Development Logic Trees



South Jersey Transportation
Planning Organization
Project Development Logic



The projects developed through this process are intended to enhance safety on curves and proactively prevent lane departure crashes. They should be considered planning level recommendations and not binding program requirements. Further development of each project will be required and should consider the pertinent conditions and potential impacts of the proposed improvements (i.e. environmental, right-of-way, utility) at each curve location.

- Notes:
1. Refer to Countermeasure Selection Memo for detailed descriptions of countermeasures included in this project development logic.
 2. Centerline and edgeline pavement markings are recommended to be installed at all curves if absent and conditions permit.
 3. Chevrons may be supplemented or replaced by large Arrow Sign according to engineering judgement (Source: 2009 MUTCD)
 4. All sign installation recommendations assume installation of a retroreflective strip on each corresponding sign post.
 5. Edge risk rating of 2C indicates approximate 2 foot shoulder and less than 15 foot clear zone, based on visual assessment.
 6. While High Friction Surface Treatment has been shown as the recommended treatment for improving pavement friction, pavement grooving and other anti-skid surfacing treatments may be considered at the engineer's discretion.

Attachment F

Project Recommendation Tables

Provided Separately to
DVRPC and SJTPO

Attachment G

Project Recommendation Table User Guides

DVRPC Region, County and Municipal Routes

Project Recommendation Spreadsheet User Guide

PREPARED FOR: DVRPC
COPY TO: File
DATE: April 10, 2020
REVISION NO.: Original

1 Background

In conjunction with the New Jersey Regional Curve Inventory and Safety Assessment contract, a study was performed to identify and diagnose the curves with the greatest potential to experience run off the road crashes. The study was performed utilizing FHWA's Systemic Safety Project Selection Processes. The systemic approach to safety is a method of safety management that typically involves lower unit cost safety improvements that are widely implemented based on the presence of risk factors.

For this project, risk factors were identified by documenting common roadway characteristics at sites within the Delaware Valley Regional Planning Commission (DVRPC) region where run off the road crashes at curves had occurred. Once the risk factors were identified, the MPO's roadway system was then screened for curves with the identified risk factors, regardless of whether crashes were present. The curves with risk factors were scored for the number of risk factors present and prioritized based on risk score, with higher risk scores indicating locations with a greater potential to experience future crashes. Countermeasures targeted at addressing the run off the road crashes were identified for consideration at each identified curve and a program of project recommendations was developed for the MPO.

The project recommendations developed through this process are documented in a Systemic Safety Project Recommendation Spreadsheet that summarizes the results of the systemic safety study of lane departure crashes at curves on County and Local Roads within the DVRPC region of New Jersey. The spreadsheet includes a prioritized list of project recommendations comprised of the safety countermeasures determined to be the most appropriate for addressing the characteristics with potential to contribute to future crashes present at each curve. This memo provides detail on how the Project Recommendation Spreadsheet can be utilized for prioritization and optimization when planning improvement projects.

2 Spreadsheet Overview

The Systemic Safety Project Recommendation Spreadsheet was created in Microsoft Excel and is comprised of the following sections: Curve Identification, Curve Attribute Data, Lane Departure

(LD) Crash Data, Risk Factors (primary and secondary), Project Recommendations, and Project Costs. All columns within each section are sortable to provide easy user interaction. The following describes the purpose and content of each section:

Curve Identification

The Curve Identification section is indicated by grey column headers and contains general information about the curve and its location. Specifically, there is a unique curve ID for every curve that was analyzed, along with the county in which each curve is located and the route that the curve lies on with its starting and ending mile points.

Curve Attribute Data

The Curve Attribute Data section is indicated by purple column headers and is a sub selection of the available site information obtained for each curve. These attributes were selected from the full data set to help guide risk factor identification and project recommendations. A summary data dictionary is included in the second tab of the Excel workbook.

Within this section there are three columns titled “Task 1 Chevron Required/ Recommended/ Optional”, “Task 1 Warning Sign Required/ Recommended”, and “Task 1 Speed Plaque Required/ Recommended”. These columns refer to Task 1 of this project in which signing at each curve location was analyzed to comply with MUTCD (Manual on Uniform Traffic Control Devices) standards. The columns specify whether the specified signing is optional, required, recommended, or none (not recommended per MUTCD standards) at each location based on the conclusions of Task 1. It is important to note that any signage that was deemed “Recommended” or “Required” as per Table 2C-5 of the 2009 MUTCD should not be treated as a project recommendation, but rather as a requirement so that each curve meets federal regulations. The column titled “Task 1 Chevron Spacing (ft)” indicated the calculated spacing of chevron signs if they were to be implemented at each given curve. Counties were informed of these MUTCD-based signing requirements under Task 1 of this project and the update and/or replacement of signs to meet standards will be performed independent of the systemic safety project development/implementation.

Lane Departure (LD) Crash Data

The Lane Departure (LD) Crash Data section is indicated by orange column headers and contains the crash information for each curve. This section gives the total number of lane departure crashes and breaks them down by severity into Fatal and Severe Injury, All Injury, and Property Damage Only crashes. The number of crashes that occurred in wet conditions and at nighttime are also provided; these crash types were used to guide selection of certain countermeasures.

Risk Factors

The Risk Factors section is indicated by green column headers and contains the attributes recommended as risk factors. These attributes were identified at curves with historically high lane departure crashes and were therefore flagged as potential indicators of run off the road crashes at all curves on the system being evaluated. Within the Primary Risk Factor columns, a solid/black star symbol (★) indicates a curve has the specific primary risk factor present. Similarly, a hollow/white star symbol (☆) indicates a curve has the specified secondary risk factor present. There is also a Total Risk Score column on the far right of this section that shows the sum of all the risk factors for each curve. Note that the Primary Risk Factors are given a value of 1.0 and Secondary Risk Factors are given a value of 0.5. See the Risk Factor Technical Memorandum for further information on primary and secondary risk factors.

Project Recommendations

The Project Recommendations section is indicated by blue column headers and contains the recommended countermeasures proposed to address the risks factors present at each curve. The presence of a black triangle symbol (▲) indicates that a specific countermeasure is recommended for a curve. Signing specific requirements and recommendations that were identified in Task 1 of the study are included in the recommendations section within the spreadsheet for reference. However, implementation of required sign upgrades should be addressed in a separate implementation effort. Costs for Task 1 signage are also included in the associated Project Costs section.

Project Costs

The Project Costs section is indicated by red headers and contains the estimated cost of each project recommendation. Notice that a cost is only listed in columns in which corresponding project recommendations are also listed. Specific corresponding project unit costs can be found on the “Unit Cost” tab of the spreadsheet tool. The costs are based on latest NJDOT average bid prices for respective pay items when available. This tab provides the user the ability to adjust unit prices as needed. Actual project costs could be subject to locations, quantity, and general contract costs (i.e. Mobilization, Traffic Control Plan, etc.) depending how these are deployed.

Some curves have more than one recommendation, therefore, there is a Total Recommendation Cost column on the far right of this section that is the sum of all recommendation costs that may apply to a curve. The row labeled contingency/other on the “Unit Cost” tab provides the user with the ability to add a lump sum that will be added to the total recommendation cost of each curve.

3 User Guide Examples

The following sections describe methods in which the information in the spreadsheet can be sorted and used in project identification and implementation. Note, the recommendation spreadsheet is “frozen” for the user to always view headers along with Curve ID.

3.1 Prioritization/Sorting by Risk Factor Score

Project prioritization by Risk Factor Score allows the user to select projects to proactively address potential crashes at the locations with the highest number of risk factors. For example, if the user wanted to identify and select projects at the top 3 ranked curves, they would proceed with the following steps:

- **Step 1:** Sort spreadsheet by Total Risk Factor Score.

Using the pull down in cell AX2, the user can sort spreadsheet by Total Risk Factor Score in descending order, to order the curves with the highest risk score (most risk factors present) at the top of the list. In this example the highest Total Risk Score is 7.5, with the next 3 highest rated curves having a score of 7. When risk factor scores are the same, as in this example, it is up to the user to decide what other factors to use when prioritizing. The user may use total cost, project recommendation type or even crash

history to determine which curves are a higher priority. For this example, we will use total lane departure crash history as a secondary filter to address the top three ranked intersections; projects to improve conditions at these three curves would be selected. Using this logic, curves D0979, D0223, and D0399 have been identified for analysis. Figure 1a shows the curve information for these three curves on the far left of the recommendation spreadsheet.

- **Step 2:** Review identified curve(s).

Once a curve or group of curves is identified, the spreadsheet can be used to reference the curve attribute data. This step provides the user a chance to check that all relevant curve attributes match what is currently in the field for a given curve. The curve attribute data was collected through a combination of field and desktop data collection; thus, it is important to review the attributes and identify potential updates. See Figure 1a.

- **Step 3:** Review project recommendations and costs.

At this point the user would review the project recommendations for each selected curve, along with the project costs. Figure 1b shows the project recommendations (with cost) for the three previously selected curves include: Centerline and Edgeline Rumble Strips (\$1,821.51), Chevron Signing (\$880), Advisory Speed Plaque (\$580), Advanced Intersection in Curve Warning Signs (\$1,590), Intersection Lighting (\$20,900), Speed Reduction Markings (\$6,594), Dynamic Curve Warning Systems (\$144,000), and High Friction Surface Treatment (HFST) (\$12,450.83). If the user were to combine the total cost for all three selected curves, improvements at the three sites would cost approximately \$188,816.34. See Figure 1b.

- **Step 4:** Select project implementation approach.

It is in this step the user determines the implementation approach for the project recommendations. This allows for full or phased implementation of the project recommendations. For example, the user may review the total cost of project recommendations and conclude that the dynamic curve warning system cost is substantially higher than all other recommendations and/or that no crashes have occurred in the past at the location that would imply the immediate need for the treatments. The user may choose to install the lower cost project recommendations at the curves as an initial project, while monitoring the location closely in the future for crashes. Dynamic curve warning systems may act as an additional phase of project implementation to address crashes should they occur. This would decrease the initial total cost of the projects to \$44,816.34, approximately 24% of the cost if all recommendations are made.

In this example, the user had to choose two of three curves that are all ranked equally according to risk factor scores. If the desire is to treat only one or two of these curves with equal rankings, the user may need to apply judgment and consider cost and potential for crash reduction. If a comparison of the relative safety benefits of the recommended countermeasures (or subset of countermeasures) considering both cost and crash reduction at each site is desired to determine of priority, additional consideration of available funding, safety performance history, perceived benefit at each site, and specific site conditions may be needed.

Figure 1a – DVRPC Project Recommendation Spreadsheet

Curve Identification										Curve Attribute Data										Lane Dependent (LD) Crash Data										Primary Risk Factors										Secondary Risk Factors																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																												
Curve ID	County	Curve Name	Route Number	Begin/End MP	Area Type	Curve Delineation Type	Curve Length (ft)	Curve Radius (ft)	Edge Risk Rating	Functional Classification	Guide Rail Present	Intersection Light	Lane Count	Lane Width (ft)	Median Type	Posted Speed Limit	Roadway Curve Lighting	Turnable Strips Present	Shoulder Type	Shoulder Width (ft)	Superelevation	Risk 3 Chevron Required/Recommended/Optional	Risk 3 Chevron Spacing (ft)	Risk 3 Advisory Speed Plaque Required/Recommended	Urban Area	Unpaved Area Name	Visual Trap Present	Warning Signs Type	Total LD Crashes	Fatal and Severe	Injury LD Crashes	Property Damage Only LD Crashes	Wet Weather LD Crashes	Nighttime LD Crashes	Absence of Guide Rail with Edge Risk Rating of 2C	Adjacent Intersection Present	Suburban Area Type	Curve Length Equal to or Greater Than 500 and Less Than 800 Feet	Functional Classification Other Than 800 Feet	Critical Aerials and Minor Functional Classification Other Than 800 Feet	Posted Speed Limit - 40 MPH and greater	Superelevation of Equal To or greater than 6% and less than 8%	History of Fatal or Severe Injury Lane Departure Crashes	Curve Radius Equal to or Greater Than 200 and Less Than 700	Number of Lanes -	Presence of Visual	Total Risk Score																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																					
000979	Gloucester	080000651, 080000651	4, 37	4.69	Present	Suburban	RCVM	228	290	2C	Minor Arty	None	No	4	11	None	40	hting Pres	None	rb and Gut	7.5	2% to 6%	80	required	none	Yes	hla PA-N	None	S-Turn	20	1	8	12	17	7	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*</

3.2 Filter by Project Type

Project prioritization by Project Type allows the user to select projects that are specific for one recommendation type. This would allow the user to organize project recommendations by countermeasure which could then be completed as a grouping of projects or systemwide deployment. For example, if the user wanted to identify every curve for which implementing post mounted delineation is recommended, they would proceed with the following steps. For this example, we will identify every curve where post mounted delineation is recommended.

- **Step 1:** Filter project recommendation spreadsheet by selected treatment / countermeasure.

To identify locations with a specific countermeasure recommendation, the user will first identify the column associated with the post mounted delineation countermeasure, column BM. Using the pull down in cell BM2, the user then selects for the cells that indicate the recommendation of post mounted delineation. This will hide all curves in which post mounted delineation is not a recommendation. See Figure 2b. For this specific example, there are a total of 357 curves that have post mounted delineation as a project recommendation. Only approximately 20 of these curves are shown in Figure 2b for spacing purposes, however, the total costs of all curves will be carried through this example.

- **Step 2:** Review identified curve(s).

Once a group of curves is identified, the spreadsheet can be used to reference the curve attribute data. This step provides the user a chance to check that all relevant curve attributes match what is currently in the field. This curve attribute data was collected through a combination of field and desktop data collection; thus, it is important to review the attributes and identify any potential changes. See Figure 2a.

- **Step 3:** Review project recommendations and costs.

Filtering the recommendation spreadsheet to show only curves in which post mounted delineation is recommended, allows the user to see the costs for each of these recommendations in the Post Mounted Delineation Cost column (column CB), see Figure 2b. The spreadsheet shows all project recommendation costs for the 357 selected curves. If the user were to combine the safety edge costs for all 357 selected curves, this example would cost approximately \$188,512.

The user may also wish to break this method down further, say to be subdivided by County. This can be done by filtering the County column (column B) by the desired County. If this were to be done for this example, the results would be as follows:

County	No. of Curves	Sum of Safety Edge Costs
Burlington	186	\$89,440
Camden	21	\$11,782
Gloucester	71	\$44,978
Mercer	79	\$42,312
Total	357	\$188,512

Figure 2a - DVRPC Project Recommendation Spreadsheet

[illegible]

Figure 2b - DVRPC Project Recommendation Spreadsheet

Curve Identification				Project Recommendations																		Costs	
Curve ID	Country	Curve Name	Route Number	Begin MP	End MP	Centerline and Edge-line Rumble Strips	Chevron Signing Cost	Guide Rail/Delineation Cost	Advanced Curve Warning Signs Cost	Advisory Speed Plaque Cost	Advanced Intersection in Curve Warning Signs Cost	Intersection Lighting Cost	Supplemental Flashing Beacons Cost	Speed Reduction Markings Cost	Dynamic Curve Warning System Cost	Visual Trap Specific Curve Signs Cost	High Friction Surface Treatment	Roadway Curve Lighting Cost	Widen Shoulder (6-foot paved) and Safety Edge Cost	Post Mounted Delineator Cost	Total Recommendation Costs		
D0065	Burlington	03000618	03000618	2.69	2.77	▲	\$ 460.65		\$ 530.00		\$ 530.00			\$ 2,198.00	\$ 48,000.00					\$ 516.00	\$ 51,751.65		
D00190	Burlington	00005945	00005945	8.58	8.42	▲	\$ 532.80		\$ 530.00		\$ 530.00			\$ 2,198.00	\$ 48,000.00		\$ 28,595.20			\$ 602.00	\$ 80,458.00		
D1245	Mercer	11061001	11061001	0.68	0.79	▲	\$ 306.36		\$ 530.00		\$ 530.00	\$ 20,900.00		\$ 2,198.00	\$ 48,000.00		\$ 16,442.24	\$ 31,300.00		\$ 430.00	\$ 120,571.60		
D1064	Mercer	11000608	11000608	0.55	0.65	▲	\$ 406.26		\$ 530.00		\$ 530.00			\$ 2,198.00	\$ 48,000.00		\$ 265.00			\$ 430.00	\$ 51,564.26		
D0027	Mercer	00005526	00005526	7.29	7.42	▲	\$ 499.50		\$ 530.00		\$ 530.00		\$ 8,316.00	\$ 2,198.00	\$ 48,000.00	\$ 265.00				\$ 688.00	\$ 12,495.50		
D0810	Camden	0400706	0400706	11.31	11.24	▲	\$ 158.73		\$ 530.00		\$ 530.00			\$ 2,198.00	\$ 48,000.00					\$ 258.00	\$ 3,144.73		
D0881	Gloucester	08000603	08000603	3.99	3.55	▲	\$ 289.71		\$ 530.00	\$ 290.00	\$ 530.00	\$ 20,900.00		\$ 2,198.00	\$ 48,000.00		\$ 14,252.92			\$ 602.00	\$ 97,394.63		
D0809	Gloucester	08000613	08000613	0.6	0.62	▲	\$ 319.68	\$ 1,980,000	\$ 530.00	\$ 290.00	\$ 530.00		\$ 8,316.00	\$ 2,198.00	\$ 48,000.00		\$ 23,531.47			\$ 1,575.00	\$ 54,668.68		
D0023	Mercer	00005526	00005526	4.21	4.16	▲			\$ 530.00		\$ 530.00		\$ 8,316.00	\$ 2,198.00	\$ 48,000.00		\$ 23,531.47			\$ 688.00	\$ 83,795.47		
D0911	Gloucester	0800615	0800615	2.1	2.06	▲	\$ 229.77			\$ 290.00				\$ 2,198.00	\$ 48,000.00		\$ 12,331.68			\$ 516.00	\$ 63,565.45		
D0264	Mercer	00005569	00005569	5.18	4.95	▲	\$ 479.52		\$ 530.00		\$ 530.00			\$ 2,198.00	\$ 48,000.00		\$ 27,880.32			\$ 602.00	\$ 79,689.8		
D0885	Gloucester	08000603	08000603	7.86	7.85	▲	\$ 555.00	\$ 3,080,000	\$ 530.00	\$ 290.00	\$ 530.00			\$ 2,198.00	\$ 48,000.00					\$ 1,548.00	\$ 56,201.00		
D0011	Mercer	0000518	0000518	11.82	11.89	▲	\$ 489.51		\$ 530.00		\$ 530.00			\$ 2,198.00	\$ 48,000.00					\$ 516.00	\$ 51,735.51		
D0025	Mercer	00005526	00005526	7.08	7.24	▲	\$ 518.37		\$ 530.00		\$ 530.00			\$ 2,198.00	\$ 48,000.00			\$ 31,300.00		\$ 774.00	\$ 85,320.37		
D0931	Burlington	03000612	03000612	3.65	3.68	▲	\$ 305.25	\$ 880,000		\$ 290.00				\$ 2,198.00	\$ 48,000.00					\$ 516.00	\$ 83,489.25		
D0947	Gloucester	08000635	08000635	6.54	6.46	▲	\$ 288.60		\$ 530.00		\$ 530.00			\$ 2,198.00	\$ 48,000.00					\$ 430.00	\$ 51,446.60		
D0611	Burlington	03241001	03241001	3.53	3.45	▲	\$ 436.23		\$ 530.00		\$ 530.00			\$ 2,198.00	\$ 48,000.00					\$ 516.00	\$ 3,680.23		
D0625	Burlington	03000667	03000667	4.25	4.14	▲	\$ 480.63		\$ 530.00		\$ 530.00			\$ 2,198.00	\$ 48,000.00					\$ 602.00	\$ 3,810.63		
D0343	Burlington	03000645	03000645	1.65	1.6	▲	\$ 200.91		\$ 530.00	\$ 290.00	\$ 530.00		\$ 8,316.00	\$ 2,198.00	\$ 48,000.00	\$ 265.00	\$ 10,782.77			\$ 930.00	\$ 71,012.68		
D0644	Burlington	0300644	0300644	5.14	5.11	▲	\$ 666.00		\$ 530.00		\$ 530.00	\$ 20,900.00	\$ 8,316.00	\$ 2,198.00	\$ 48,000.00	\$ 265.00	\$ 3,739.18			\$ 1,500.00	\$ 60,312.00		
D0644	Mercer	0300644	0300644	5.14	5.11	▲			\$ 530.00		\$ 530.00	\$ 20,900.00	\$ 8,316.00	\$ 2,198.00	\$ 48,000.00	\$ 265.00	\$ 3,739.18			\$ 1,500.00	\$ 60,312.00		

3.3 Project Planning and Programming

The provided project recommendation spreadsheet created from the results of systemic safety analysis allows the user to select projects based on multiple different methods. As previously mentioned, the user may select a project based on the risk factor score or based on individual countermeasures. The project recommendation spreadsheet can also be used for project planning and programming. For example, if a pavement resurfacing project is planned along a specific route in the future, a user could see if there are recommendations from this study that could be incorporated into the planned resurfacing project. The user can use the project recommendation spreadsheet to check for all curves along the route that fall within the project limits to determine if any safety countermeasures are recommended. Sorting the spreadsheet by Route Number (column D) and then referencing the Begin MP and End MP will reveal the number of curves that fall along a particular route within given project limits. The user can then decide if they would like to include any or all of the recommended safety countermeasures as part of the resurfacing project.

4 Conclusions

The DVRPC Systemic Safety Project Recommendation Spreadsheet was developed to provide the DVRPC with recommendations for safety countermeasures that can effectively and proactively address run off the road crashes on curves within their jurisdiction. While the outcome of Task 1 of this project was intended to define the requirements for signing that are needed to comply with MUTCD standards, it was not intended for the recommendations generated from Task 2, the systemic process, to be requirements. Rather, the Systemic Safety Project Recommendation Spreadsheet has been developed to provide the DVRPC and member counties the flexibility to select and implement, at their discretion, the countermeasures in a manner that best fits their individual programs, resources, and funding availability. When considering the implementation of the countermeasures at a given site or group of sites the recommendations can be implemented in a phased manner or as complete projects. The spreadsheet allows for sorting by rank, countermeasure type, county, and route to facilitate a variety of implementation approaches.

SJTPO Region, County and Municipal Routes

Project Recommendation Spreadsheet User Guide

PREPARED FOR: SJTPO
COPY TO: File
DATE: April 10, 2020
REVISION NO.: Original

1 Background

In conjunction with the New Jersey Regional Curve Inventory and Safety Assessment contract, a study was performed to identify and diagnose the curves with the greatest potential to experience run off the road crashes. The study was performed utilizing FHWA's Systemic Safety Project Selection Processes. The systemic approach to safety is a method of safety management that typically involves lower unit cost safety improvements that are widely implemented based on the presence of risk factors.

For this project, risk factors were identified by documenting common roadway characteristics at sites within the South Jersey Transportation Planning Organization (SJTPO) region where run off the road crashes at curves had occurred. Once the risk factors were identified, the MPO's roadway system was then screened for curves with the identified risk factors, regardless of whether crashes were present. The curves with risk factors were scored for the number of risk factors present and prioritized based on risk score, with higher risk scores indicating locations with a greater potential to experience future crashes. Countermeasures targeted at addressing the run off the road crashes were identified for consideration at each identified curve and a program of project recommendations was developed for the MPO.

The project recommendations developed through this process are documented in a Systemic Safety Project Recommendation Spreadsheet that summarizes the results of the systemic safety study of lane departure crashes at curves on County and Local Roads within the SJTPO region of New Jersey. The spreadsheet includes a prioritized list of project recommendations comprised of the safety countermeasures determined to be the most appropriate for addressing the characteristics with potential to contribute to future crashes present at each curve. This memo provides detail on how the Project Recommendation Spreadsheet can be utilized for prioritization and optimization when planning improvement projects.

2 Spreadsheet Overview

The Systemic Safety Project Recommendation Spreadsheet was created in Microsoft Excel and is comprised of the following sections: Curve Identification, Curve Attribute Data, Lane Departure (LD) Crash Data, Risk Factors (primary and secondary), Project Recommendations, and Project

Costs. All columns within each section are sortable to provide easy user interaction. The following describes the purpose and content of each section:

Curve Identification

The Curve Identification section is indicated by grey column headers and contains general information about the curve and its location. Specifically, there is a unique curve ID for every curve that was analyzed, along with the county in which each curve is located and the route that the curve lies on with its starting and ending mile points.

Curve Attribute Data

The Curve Attribute Data section is indicated by purple column headers and is a sub selection of the available site information obtained for each curve. These attributes were selected from the full data set to help guide risk factor identification and project recommendations. A summary data dictionary is included in the second tab of the Excel workbook.

Within this section there are three columns titled “Task 1 Chevron Required/ Recommended/ Optional”, “Task 1 Warning Sign Required/ Recommended”, and “Task 1 Speed Plaque Required/ Recommended”. These columns refer to Task 1 of this project in which signing at each curve location was analyzed to comply with MUTCD (Manual on Uniform Traffic Control Devices) standards. The columns specify whether the specified signing is optional, required, recommended, or none (not recommended per MUTCD standards) at each location based on the conclusions of Task 1. It is important to note that any signage that was deemed “Recommended” or “Required” as per Table 2C-5 of the 2009 MUTCD should not be treated as a project recommendation, but rather as a requirement so that each curve meets federal regulations. The column titled “Task 1 Chevron Spacing (ft)” indicates the calculated spacing of chevron signs if they were to be implemented at each given curve. Counties were informed of these MUTCD-based signing requirements under Task 1 of this project and the update and/or replacement of signs to meet standards will be performed independent of the systemic safety project development/implementation.

Lane Departure (LD) Crash Data

The Lane Departure (LD) Crash Data section is indicated by orange column headers and contains the crash information for each curve. This section gives the total number of lane departure crashes and breaks them down by severity into Fatal and Severe Injury, All Injury, and Property Damage Only crashes. The number of crashes that occurred in wet conditions and at nighttime are also provided; these crash types were used to guide selection of certain countermeasures.

Risk Factors

The Risk Factors section is indicated by green column headers and contains the attributes recommended as risk factors. These attributes were identified at curves with historically high lane departure crashes and were therefore flagged as potential indicators of run off the road crashes at all curves on the system being evaluated. Within the Primary Risk Factor columns, a solid/black star symbol (★) indicates a curve has the specific primary risk factor present. Similarly, a hollow/white star symbol (☆) indicates a curve has the specified secondary risk factor present. There is also a Total Risk Score column on the far right of this section that shows the sum of all the risk factors for each curve. Note that the Primary Risk Factors are given a value of 1.0 and Secondary Risk Factors are given a value of 0.5. See the Risk Factor Technical Memorandum for further information on primary and secondary risk factors.

Project Recommendations

The Project Recommendations section is indicated by blue column headers and contains the recommended countermeasures proposed to address the risks factors present at each curve. The presence of a black triangle symbol (▲) indicates that a specific countermeasure is recommended for a curve. Signing specific requirements and recommendations that were identified in Task 1 of the study are included in the recommendations section within the spreadsheet for reference. However, implementation of required sign upgrades will be addressed in a separate implementation effort. Costs for Task 1 signage are also included in the associated Project Costs section.

Project Costs

The Project Costs section is indicated by red headers and contains the estimated cost of each project recommendation. Notice that a cost is only listed in columns in which corresponding project recommendations are also listed. Specific corresponding project unit costs can be found on the “Unit Cost” tab of the spreadsheet tool. The costs are based on latest NJDOT average bid prices for respective pay items when available. This tab provides the user the ability to adjust unit prices as needed. Actual project costs could be subject to locations, quantity, and general contract costs (i.e. Mobilization, Traffic Control Plan, etc.) depending how these are deployed.

Some curves have more than one recommendation, therefore, there is a Total Recommendation Cost column on the far right of this section that is the sum of all recommendation costs that may apply to a curve. The row labeled contingency/other on the “Unit Cost” tab provides the user with the ability to add a lump sum that will be added to the total recommendation cost of each curve.

3 User Guide Examples

The following sections describe methods in which the information in the spreadsheet can be sorted and used in project identification and implementation. Note, the recommendation spreadsheet is “frozen” for the user to always view headers along with the Curve Identification information.

3.1 Prioritization/Sorting by Risk Factor Score

Project prioritization by Risk Factor Score allows the user to select projects to proactively address potential crashes at the locations with the highest number of risk factors. For example, if the user wanted to identify and select projects at the top 3 ranked curves, they would proceed with the following steps:

- **Step 1:** Sort spreadsheet by Total Risk Factor Score.

Using the pull down in cell AX2, the user can sort spreadsheet by Total Risk Factor Score in descending order, to order the curves with the highest risk score (most risk factors present) at the top of the list. In this example the highest two Total Risk Scores are 6, with the next 2 highest rated curves having a score of 5.5. When risk factor scores are the same, as in this example, it is up to the user to decide what other factors to use when prioritizing. The user may use total cost, project recommendation type or even crash history to determine which curves are a higher priority. For this example, we will use total lane departure crash history as a secondary filter to address the top three ranked intersections; projects to improve conditions at these three curves would be

selected. Using this logic, curves S452, S553, and S491 have been identified for analysis. Figure 1a shows the curve information for these three curves on the far left of the recommendation spreadsheet.

- **Step 2:** Review identified curve(s).

Once a curve or group of curves is identified, the spreadsheet can be used to reference the curve attribute data. This step provides the user a chance to check that all relevant curve attributes match what is currently in the field for a given curve. The curve attribute data was collected through a combination of field and desktop data collection; thus, it is important to review the attributes and identify potential updates. See Figure 1a.

- **Step 3:** Review project recommendations and costs.

At this point the user would review the project recommendations for each selected curve, along with the project costs. Figure 1b shows the project recommendations (with cost) for the three previously selected curves include: Centerline and Edgeline Rumble Strips (\$1,487.40), Advanced Intersection in Curve Warning Signs (\$1,060), Intersection Lighting (\$20,900), Supplemental Flashing Beacons (\$8,236), Speed Reduction Markings (\$6,594), Dynamic Curve Warning Systems (\$144,000), High Friction Surface Treatment (HFST) (\$38,901.39), and Post Mounted Delineation (\$2,236). If the user were to combine the total cost for all three selected curves, improvements at the three sites would cost approximately \$223,494.79. See Figure 1b.

- **Step 4:** Select project implementation approach.

It is in this step the user determines the implementation approach for the project recommendations. This allows for full or phased implementation of the project recommendations. For example, the user may review the total cost of project recommendations for the curves and conclude that the dynamic curve warning system costs are substantially higher than other recommendations and/or that no crashes have occurred in the past at the location that would imply the immediate need for the treatments. The user may choose to install the lower cost project recommendations at these curves as an initial project, while monitoring the location closely in the future for crashes. Dynamic curve warning systems could be considered as a second phase of project implementation to address crashes should they occur. This would decrease the total cost of the projects to \$79,494.79, approximately a 36% of the cost if dynamic curve warning system recommendations are made.

In this example, the user had to choose one of two curves that were both equally ranked by risk factor score. If the desire is to treat only one of these curves with equal rankings, the user may need to apply judgment and consider cost and potential for crash reduction. If a comparison of the relative safety benefits of the recommended countermeasures (or subset of countermeasures) considering both cost and crash reduction at each site is desired to determine priority, additional consideration of available funding, safety performance history, perceived benefit at each site, and specific site conditions may be needed.

Figure 1a – SJTPO Project Recommendation Spreadsheet

[illegible]

Figure 1b – SJTPO Project Recommendation Spreadsheet

Curve Identification			Project Recommendations										Project Costs										
Curve ID	County	Curve Name	Route Number	Begin MP	End MP	Centerline and Edge Line	Churnible Strips	Churnible Strips	Guide Rail Delineation	Advanced Curve Warning Signs	Signs Cost	Advisory Speed Plaque Cost	Advanced Intersection in Curve Warning Signs	Intersection Lighting Cost	Supplemental Flashing Beacons Cost	Speed Reduction Markings Cost	Median Post Mounted Delineation Cost	Dynamic Curve Warning System Cost	High Friction Surface Treatment Cost	Roadway Curve Lighting	Widen Shoulder (5 foot paved) and Safety Edge Cost	Post Mounted Delineation Cost	Total Recommendation Costs
S452	Cape May	05000620_05000620	5553	0.71	0.57	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 73,096.33
S453	Cumberland	06000655_06000655	5553	5.07	4.93	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 98,189.39
S491	Cape May	05000654_05000654	5491	0.26	0.34	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 52,209.07
S492	Atlantic	00000542_00000542	5025	1.28	1.08	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 2,499.68
S405	Cape May	05000603_05000603	5405	5.9	5.8	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 2,693.38
S479	Cape May	05000631_05000631	5479	4.21	4.08	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 2,728.00
S477	Cape May	05000619_05000619	5477	2.16	2.31	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 774.00
S585	Atlantic	01110501_01110501	5855	0.66	0.74	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 25,036.00
S172	Atlantic	00000561_00000561	5182	23.86	23.81	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 89,489.80
S240	Atlantic	01000608_01000608	5240	2.67	2.71	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 52,902.62
S446	Cape May	05000619_05000619	5446	17.42	17.51	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 50,987.74
S087	Cumberland	000005520_000005525	5087	0.56	0.62	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 2,923.00
S403	Cape May	05000603_05000603	5403	1.3	1.18	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 2,728.00
S421	Cape May	05000611_05000611	5421	2.93	2.9	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 3,598.24
S509	Cape May	05071003_05071003	5509	1.38	1.47	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 4,185.49
S494	Cape May	05000654_05000654	5494	0.83	0.91	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 2,728.00
S486	Cape May	05000639_05000639	5486	1.27	1.46	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 89,224.37
S637	Salem	17000639_17000639	5637	5.01	4.91	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 30,091.98
S022	Salem	0970540_09000540	5022	31.48	31.38	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S050	Atlantic	0542_00000542	5050	3.71	3.82	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S051	Atlantic	0542_00000542	5051	3.82	3.95	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S052	Atlantic	0542_00000542	5052	3.95	4.08	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S053	Atlantic	0542_00000542	5053	4.08	4.21	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S054	Atlantic	0542_00000542	5054	4.21	4.3	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S055	Atlantic	0542_00000542	5055	4.3	4.43	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S056	Atlantic	0542_00000542	5056	4.43	4.56	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S057	Atlantic	0542_00000542	5057	4.56	4.69	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S058	Atlantic	0542_00000542	5058	4.69	4.82	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S059	Atlantic	0542_00000542	5059	4.82	4.95	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S060	Atlantic	0542_00000542	5060	4.95	5.08	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S061	Atlantic	0542_00000542	5061	5.08	5.21	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S062	Atlantic	0542_00000542	5062	5.21	5.34	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S063	Atlantic	0542_00000542	5063	5.34	5.47	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S064	Atlantic	0542_00000542	5064	5.47	5.6	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S065	Atlantic	0542_00000542	5065	5.6	5.73	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S066	Atlantic	0542_00000542	5066	5.73	5.86	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S067	Atlantic	0542_00000542	5067	5.86	5.99	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S068	Atlantic	0542_00000542	5068	5.99	6.12	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S069	Atlantic	0542_00000542	5069	6.12	6.25	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S070	Atlantic	0542_00000542	5070	6.25	6.38	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S071	Atlantic	0542_00000542	5071	6.38	6.51	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S072	Atlantic	0542_00000542	5072	6.51	6.64	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S073	Atlantic	0542_00000542	5073	6.64	6.77	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S074	Atlantic	0542_00000542	5074	6.77	6.9	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S075	Atlantic	0542_00000542	5075	6.9	7.03	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S076	Atlantic	0542_00000542	5076	7.03	7.16	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S077	Atlantic	0542_00000542	5077	7.16	7.29	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S078	Atlantic	0542_00000542	5078	7.29	7.42	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S079	Atlantic	0542_00000542	5079	7.42	7.55	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S080	Atlantic	0542_00000542	5080	7.55	7.68	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S081	Atlantic	0542_00000542	5081	7.68	7.81	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S082	Atlantic	0542_00000542	5082	7.81	7.94	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S083	Atlantic	0542_00000542	5083	7.94	8.07	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S084	Atlantic	0542_00000542	5084	8.07	8.2	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S085	Atlantic	0542_00000542	5085	8.2	8.33	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S086	Atlantic	0542_00000542	5086	8.33	8.46	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S087	Atlantic	0542_00000542	5087	8.46	8.59	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S088	Atlantic	0542_00000542	5088	8.59	8.72	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S089	Atlantic	0542_00000542	5089	8.72	8.85	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S090	Atlantic	0542_00000542	5090	8.85	8.98	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S091	Atlantic	0542_00000542	5091	8.98	9.11	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S092	Atlantic	0542_00000542	5092	9.11	9.24	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S093	Atlantic	0542_00000542	5093	9.24	9.37	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S094	Atlantic	0542_00000542	5094	9.37	9.5	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S095	Atlantic	0542_00000542	5095	9.5	9.63	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S096	Atlantic	0542_00000542	5096	9.63	9.76	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	\$ 48,000.00
S097	Atlantic	0542_00000542	5097	9.76	9.89	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	▲	

3.2 Filter by Project Type

Project prioritization by Project Type allows the user to select projects that are specific for one recommendation type. This would allow the user to organize project recommendations by countermeasure which could then be completed as a grouping of projects or systemwide deployment. For example, if the user wanted to identify every curve for which implementing post mounted delineation is recommended, they would proceed with the following steps. For this example, we will identify every curve where post mounted delineation is recommended. The user should note that along with post mounted delineation recommendations, there are also median post mounted delineation recommendations. For the purposes of this example, median post mounted delineation will not be included.

- **Step 1:** Filter project recommendation spreadsheet by selected treatment / countermeasure.
To identify locations with a specific countermeasure recommendation, the user will first identify the column associated with the post mounted delineation countermeasure, column BM. Using the pull down in cell BM2, the user then selects for the cells that indicate the recommendation of post mounted delineation. This will hide all curve with in which post mounted delineation is not recommended. See Figure 2b. For this specific example, there are a total of 214 curves that have post mounted delineation as a project recommendation. Only approximately 20 of these curves are shown in Figure 2b for spacing purposes, however, the total costs of all curves will be carried through this example.
- **Step 2:** Review identified curve(s).
Once a group of curves is identified, the spreadsheet can be used to reference the curve attribute data. This step provides the user a chance to check that all relevant curve attributes match what is currently in the field. This curve attribute data was collected through a combination of field and desktop data collection; thus, it is important to review the attributes and identify any potential changes. See Figure 2a.
- **Step 3:** Review project costs.
- Filtering the recommendation spreadsheet to show only curves in which post mounted delineation, independent of median post mounted delineation, is recommended, allows the user to see the costs for each of these recommendations in the Post Mounted Delineation Cost column (column CB). See Figure 2b. The spreadsheet shows all project recommendation costs for the 214 selected curves. If the user were to combine the post mounted delineation costs for all 214 selected curves, this example would cost approximately \$127,538. The user may also wish to break this method down further, say to be subdivided by County. This can be done by filtering the County column (column B) by the desired County. If this were to be done for this example, the results would be as follows:

County	No. of Curves	Sum of Safety Edge Costs
Atlantic	61	\$31,562
Cape May	58	\$32,938
Cumberland	51	\$37,410
Salem	44	\$25,628
Total	214	\$127,538

Figure 2a - SJTPO Project Recommendation Spreadsheet

Curve Identification										Curve Attribute Data										Line Departure (LD) Crash Data										Primary Risk Factors										Secondary Risk Factors																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
Curve ID	County	Curve Name	Route Number	Reg in MP	End MP	Lane Count	Lane Width (ft)	Median Type	Posted Speed Limit	Roadway Curve Lighting	Shoulder Type	Shoulder Width (ft)	Superelevation	Tack 1 Chevron Required/Recommended/Optional	Tack 1 Chevron Spacing (ft)	Tack 1 Curve Warning Sign Required/Recommended	Tack 1 Advisory Speed Plaque Required/Recommended	Urban Area	Urbanized Area Name	Visual Trap Present	Warning Signs Type	Total LD Crashes	Fatal and Severe LD Crashes	Injury LD Crashes	Property Damage Only LD Crashes	Wet Weather LD Crashes	Nighttime LD Crashes	Adjacent Intersection Present	Lane Width of 12 ft or More	Radius 1,000 ft or Less AND Lane Width of 12 ft or More	Posted Speed Limit 40 or 45 MPH	Shoulder Width 5.5 ft or Greater and Edge Risk of 2C or Less	Superelevation of equal to/ Greater than 3% and Less than 5%	Curve Length Equal to/ Greater than 500 and Less than 800 Feet	History of Fatal or Severe Crashes	Injury Lane Departure Crashes	Functional Classification	Other Principal Arterial	Median Present	Shoulder Width 5.5 ft or Greater and Edge Risk of 1 or Less	Total Risk Score																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																															
5452	Cape May	05000620_05000620	Present	None	709	1340	2C	Major Art	None	45	Present	None	3.3.9%	none	200	none	none	Yes	Villas, NJ	Yes	ive Wami	4	1	1	3	0	2	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*

3.3 Project Planning and Programming

The provided project recommendation spreadsheet created from the results of systemic safety analysis allows the user to select projects based on multiple different methods. As previously mentioned, the user may select a project based on the risk factor score or based on individual countermeasures. The project recommendation spreadsheet can also be used for project planning and programming. For example, if a pavement resurfacing project is planned along a specific route in the future, a user could see if there are recommendations from this study that could be incorporated into the planned resurfacing project. The user can use the project recommendation spreadsheet to check for all curves along the route that fall within the project limits to determine if any safety countermeasures are recommended. Sorting the spreadsheet by Route Number (column D) and then referencing the Begin MP and End MP will reveal the number of curves that fall along a particular route within given project limits. The user can then decide if they would like to include any or all of the recommended safety countermeasures as part of the resurfacing project.

4 Conclusions

The SJTPO Systemic Safety Project Recommendation Spreadsheet was developed to provide the SJTPO with recommendations for safety countermeasures that can effectively and proactively address run off the road crashes on curves within their jurisdiction. While the outcome of Task 1 of this project was intended to define the requirements for signing that are needed to comply with MUTCD standards, it was not intended for the recommendations generated from Task 2, the systemic process, to be requirements. Rather, the Systemic Safety Project Recommendation Spreadsheet has been developed to provide the SJTPO and member counties the flexibility to select and implement, at their discretion, the countermeasures in a manner that best fits their individual programs, resources, and funding availability. When considering the implementation of the countermeasures at a given site or group of sites the recommendations can be implemented in a phased manner or as complete projects. The spreadsheet allows for sorting by rank, countermeasure type, county, and route to facilitate a variety of implementation approaches.