



8. PREDICTIVE SAFETY ANALYSIS

An analysis of the predicted number of crashes along mainline I-275 and I-4 was conducted for both the No-Build and Build concepts to assess and compare the safety conditions of both alternatives. The study area limits for the safety analysis on I-275 extend from Ashley Drive/Tampa Street interchange to north of Dr. MLK, Jr. Boulevard along I-275 and from I-275 to the Selmon Expressway Connector along I-4.

The study period for this project is between 2025 and 2045.

8.1 Data Collection

- The Opening Year (2025) and the Design Year (2045) traffic volumes for all the basic freeway segments and ramps were used.
- All the required geometric design and traffic control data were obtained from the design files.

8.2 Methodology

The analysis followed the procedures from Chapters 18 and 19 of the Highway Safety Manual (HSM) – 1st Edition Supplement 2014 by the American Association of State Highway and Transportation Officials (AASHTO). The HSM provides techniques to estimate crashes for a given facility, test the effectiveness of design alternatives on crash reduction, and evaluate their economic crash benefits. The analysis compares the anticipated number of crashes between the No-Build and Build Alternatives within the study limits for the study period. This analysis was completed using the Enhanced Interchange Safety Analysis Tool (ISATe), an Excel based worksheet that analyzes the safety performance of freeways, and ramps based on facility type, traffic volumes, and roadway geometric conditions. The HSM freeway crash-predictive models have not been calibrated with Florida jurisdiction-specific data. However, since the objective is to compare the difference between the two alternatives, rather than the predicted crash frequency, calibration rates are not necessary.

8.3 Analysis

The project was divided into freeway segments and ramps segments. All the freeway segments within the study limits were included in the freeway analysis whereas the ramps at the interchange were included in the ramp analysis. However, the ramp terminals were not included



in the analysis. The results from the analysis based on KABCO levels (Fatal crashes- (K), Incapacitating injury (A), Non-Incapacitating (B), Possible Injury (C) and Property Damage only (PDO or O) and crash types are summarized in following sections. The Enhanced Interchange Safety Analysis Tool (ISATe) output summary sheets are provided in **Appendix J**.

8.3.1 Predicted Crashes for the No-Build Alternative

The ISATe worksheet was utilized to analyze the predicted crashes for the No-Build Alternative using the Opening Year (2025) and the Design Year (2045) traffic projections. The summary results for the I-275 and I-4 No-Build Alternatives by severity and crash type are shown in **Table 8-1** through **Table 8-4**, respectively.

The predicted number of crashes along I-275 over the study period is 10,050.0, with 77.6 fatal (K) crashes, 231.0 incapacitating injury (A) crashes, 1,371.0 non-incapacitating (B) crashes, 3,466.0 possible injury (C) crashes and 4,904.4 property damage only (PDO) crashes. Approximately 49 percent of crashes are PDO crashes. Of the total 10,050.0 crashes, 5,538.1 crashes occur on freeway segments, 4,404.9 crashes occur on the ramps, and 107.0 crashes occur on express lane ramps. The top three collision types are rear-end crashes (57%), sideswipe crashes (17%), and crashes with fixed objects (13%). Approximately 83 percent of crashes involved multiple-vehicle crashes.

The predicted number of crashes on I-4 over the study period is 3,635.2, with 14.3 fatal (K) crashes, 41.2 incapacitating injury (A) crashes, 233.1 non-incapacitating (B) crashes, 771.8 possible injury (C) crashes and 2,574.9 property damage only (PDO) crashes. Approximately 71 percent of crashes are PDO crashes. Of the total 3,635.2 crashes, 3,197.8 crashes occur on freeway segments and 437.4 crashes occur on the ramps. The top three collision types are rear-end crashes (58%), sideswipe crashes (21%), and crashes with fixed objects (12%). Approximately, 84 percent of crashes involved multiple-vehicle crashes.

Table 8-1 - Predicted Crashes for the I-275 No-Build Alternative by Severity

Crash Severity	No-Build General Use Lanes	Express Lanes	Total No-Build	
K	76.7	0.9	77.6	0.8%
A	228.4	2.6	231.0	2.3%
B	1,357.2	13.8	1,371.0	13.6%
C	3,439.0	27.0	3,466.0	34.5%
PDO	4,841.7	62.7	4,904.4	48.8%
Total Freeway Crashes	5,538.1	0.0	5,538.1	55.1%
Total Ramp Crashes	4,404.9	107.0	4,511.9	44.9%
Total Crashes	9,943.0	107.0	10,050.0	

**Table 8-2 - Predicted Crashes for the I-275 No-Build Alternative by Crash Type**

Crash Type	Crash Type Category	No-Build General Use Lanes	Express Lanes	Total No-Build	
Multiple Vehicle	Head-on crashes:	71.0	0.4	71.3	0.7%
	Right-angle crashes:	129.3	0.2	129.5	1.3%
	Rear-end crashes:	5,743.1	19.3	5,762.3	57.3%
	Sideswipe crashes:	1,693.6	8.5	1,702.1	16.9%
	Other multiple-vehicle crashes:	635.6	3.6	639.3	6.4%
	Total multiple-vehicle crashes:	8,272.6	32.0	8,304.5	82.6%
Single Vehicle	Crashes with animal:	20.9	0.3	21.2	0.2%
	Crashes with fixed object:	1,228.8	58.7	1,287.5	12.8%
	Crashes with other object:	142.0	1.5	143.4	1.4%
	Crashes with parked vehicle:	24.3	0.9	25.2	0.3%
	Other single-vehicle crashes	254.4	13.7	268.1	2.7%
	Total single-vehicle crashes:	1,670.4	75.0	1,745.4	17.4%

Table 8-3 - Predicted Crashes for the I-4 No-Build Alternative by Severity

Crash Severity	No-Build	
K	14.3	0.4%
A	41.2	1.1%
B	233.1	6.4%
C	771.8	21.2%
PDO	2,574.9	70.8%
Total Freeway Crashes	3,197.8	88.0%
Total Ramp Crashes	437.4	12.0%
Total Crashes	3,635.2	

Table 8-4 - Predicted Crashes for the I-4 No-Build Alternative by Crash Type

Crash Type	Crash Type Category	No-Build	
Multiple Vehicle	Head-on crashes:	13.0	0.4%
	Right-angle crashes:	60.5	1.7%
	Rear-end crashes:	2,123.4	58.4%
	Sideswipe crashes:	746.4	20.5%
	Other multiple-vehicle crashes:	103.9	2.9%
	Total multiple-vehicle crashes:	3,047.2	83.8%
Single Vehicle	Crashes with animal:	7.3	0.2%
	Crashes with fixed object:	432.2	11.9%
	Crashes with other object:	52.4	1.4%
	Crashes with parked vehicle:	8.1	0.2%
	Other single-vehicle crashes	88.0	2.4%
	Total single-vehicle crashes:	588.0	16.2%



8.3.2 Predicted Crashes for the Build Alternative

The ISATe worksheet was utilized to analyze the predicted crashes for the Build Alternative using the Opening Year (2025) and the Design Year (2045) traffic projections. The summary results for the I-275 and I-4 Build Alternatives by severity crash type are shown in **Table 8-5** through **Table 8-8**, respectively.

The predicted number of crashes on I-275 over the study period is 7,531.6, with 40.8 fatal (K) crashes, 119.7 incapacitating injury (A) crashes, 670.3 non-incapacitating (B) crashes, 1,998.7 possible injury (C) crashes, and 4,702.1 property damage only (PDO) crashes. 62 percent of crashes are PDO crashes. Of the total 7,531.6 crashes, 5,079.1 crashes occur on freeway segments, 2,345.5 crashes occur on the general use lane ramps, and 107.0 crashes occur on express lane ramps. The top three collision types are rear-end crashes (53%), sideswipe crashes (18%) and crashes with fixed objects (17%). 78 percent of crashes involved multiple-vehicle crashes.

The predicted number of crashes on I-4 over the study period is 3,298.0, with 13.3 fatal (K) crashes, 38.3 incapacitating injury (A) crashes, 217.6 non-incapacitating (B) crashes, 710.3 possible injury (C) crashes, and 2,318.4 property damage only (PDO) crashes. 70 percent of crashes are PDO crashes. Of the total 3,298.0 crashes, 2,913.5 crashes occur on freeway segments and 384.5 crashes occur on the ramps. The top three collision types are rear-end crashes (58%), sideswipe crashes (20%) and crashes with fixed objects (12%). 83 percent of crashes involved multiple-vehicle crashes.

Table 8-5 - Predicted Crashes for the I-275 Build Alternative by Severity

Crash Severity	Build General Use Lanes	Express Lanes	Total Build	
K	39.9	0.9	40.8	0.5%
A	117.1	2.6	119.7	1.6%
B	656.5	13.8	670.3	8.9%
C	1,971.7	27.0	1,998.7	26.5%
PDO	4,639.4	62.7	4,702.1	62.4%
Total Freeway Crashes	5,079.1	0.0	5,079.1	67.4%
Total Ramp Crashes	2,345.5	107.0	2,452.5	32.6%
Total Crashes	7,424.6	107.0	7,531.6	

**Table 8-6 - Predicted Crashes for the I-275 Build Alternative by Crash Type**

Crash Type	Crash Type Category	Build General Use Lanes	Build Managed Lanes	Total Build	
Multiple Vehicle	Head-on crashes:	37.8	0.4	38.11	0.5%
	Right-angle crashes:	100.2	0.2	100.44	1.3%
	Rear-end crashes:	3,999.4	19.3	4,018.62	53.4%
	Sideswipe crashes:	1,356.1	8.5	1,364.60	18.1%
	Other multiple-vehicle crashes:	332.1	3.6	335.77	4.5%
	Total multiple-vehicle crashes:	5,825.6	32.0	5,857.54	77.8%
Single Vehicle	Crashes with animal:	19.4	0.3	19.73	0.3%
	Crashes with fixed object:	1,181.4	58.7	1,240.08	16.5%
	Crashes with other object:	130.4	1.5	131.82	1.8%
	Crashes with parked vehicle:	23.1	0.9	24.00	0.3%
	Other single-vehicle crashes	244.8	13.7	258.45	3.4%
	Total single-vehicle crashes:	1,599.1	75.0	1,674.09	22.2%

Table 8-7 - Predicted Crashes for the I-4 Build Alternative by Severity

Crash Severity	Build	
K	13.3	0.4%
A	38.3	1.2%
B	217.6	6.6%
C	710.3	21.5%
PDO	2,318.4	70.3%
Total Freeway Crashes	2,913.5	88.3%
Total Ramp Crashes	384.5	11.7%
Total Crashes	3,298.0	

Table 8-8 - Predicted Crashes for the I-4 Build Alternative by Crash Type

Crash Type	Crash Type Category	Build	
Multiple Vehicle	Head-on crashes:	11.8	0.4%
	Right-angle crashes:	54.9	1.7%
	Rear-end crashes:	1911.8	58.0%
	Sideswipe crashes:	673.5	20.4%
	Other multiple-vehicle crashes:	94.1	2.9%
	Total multiple-vehicle crashes:	2746.1	83.3%
Single Vehicle	Crashes with animal:	7.0	0.2%
	Crashes with fixed object:	403.8	12.2%
	Crashes with other object:	50.9	1.5%
	Crashes with parked vehicle:	7.9	0.2%
	Other single-vehicle crashes	82.3	2.5%
	Total single-vehicle crashes:	551.9	16.7%



8.3.3 Summary of Results and Conclusions

The results of the predictive analysis show that there is an anticipated reduction in crashes over the length of the study period by implementing the Build Alternative. The summary of predicted crashes based on KABCO levels for the freeway and ramps and for the entire facility in the study limit is given in **Table 8-9** and **Table 8-10** below respectively. Even though there is an increase in the AADT, as well as number of lanes, I-275 is expected to see a reduction in crashes of 25 percent, and I-4 is expected to see a reduction of nine percent as seen in **Figure 8-1**. This reduction is likely due to proposed improvements shown in the Build condition creating much safer conditions for the vehicles using I-275 and I-4.

Table 8-9 - Summary of Predicted Crashes by Facility

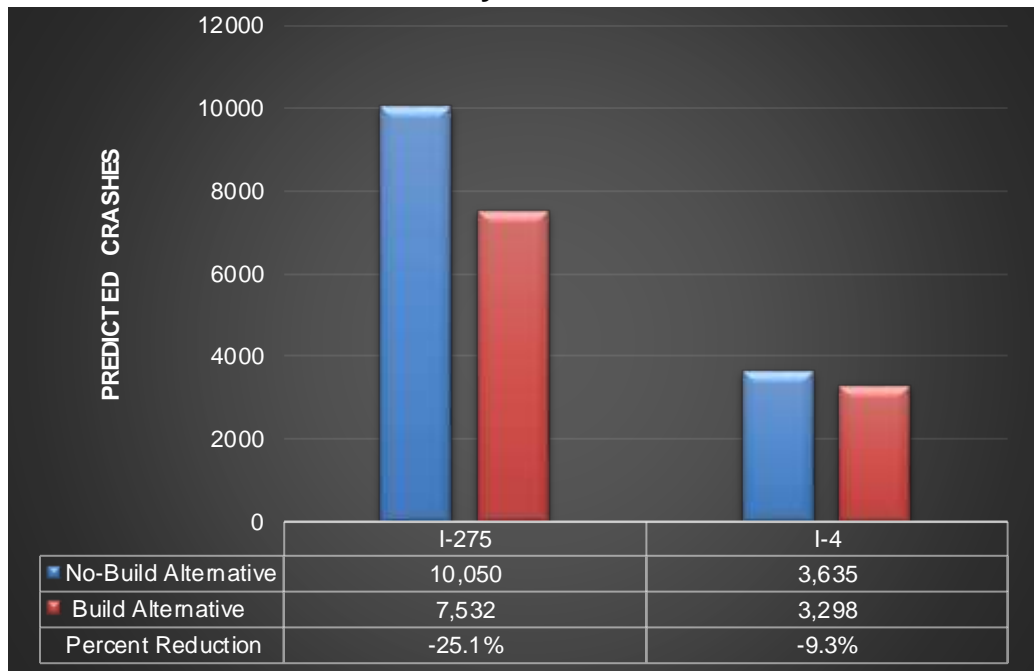
		TOTAL	K	A	B	C	PDO
I-275 No-Build	Freeway	5,538.1	20.0	56.4	340.2	1,187.9	3,933.6
	Ramp	4,511.9	57.6	174.6	1,030.8	2,278.1	970.8
I-275 Build	Freeway	5,079.1	18.6	52.4	314.8	1,085.2	3,608.1
	Ramp	2,452.5	22.2	67.3	355.5	913.5	1,094.0
I-4 No-Build	Freeway	3,197.8	11.4	32.6	184.9	665.6	2,303.3
	Ramp	437.4	2.8	8.6	48.2	106.2	271.5
I-4 Build	Freeway	2,913.5	11.0	31.3	176.7	617.3	2,077.2
	Ramp	384.5	2.3	7.1	40.9	93.0	241.3

Table 8-10 - Summary of Predicted Crashes

KABCO Level	I-275 No-Build	I-275 Build	I-4 No-Build	I-4 Build
K	77.6	40.8	14.3	13.3
A	231.0	119.7	41.2	38.3
B	1,371.0	670.3	233.1	217.6
C	3,466.0	1,998.7	771.8	710.3
O	4,904.4	4,702.1	2,574.9	2,318.4
Total	10,050.0	7,531.6	3,635.2	3,298.0



Figure 8-1 - Predicted Crash Summary – No-Build Alternative & Build Alternative



The I-275 corridor sees reductions in fatal crashes and individual severity types, with the largest decrease in injury (B) crashes with 51 percent, 48 percent reduction in serious injury (A) crashes and 47 percent reduction in the fatal injury (K) crashes. I-4 sees large reductions in property damage only (PDO) crashes and possible injury (C) crashes, 10 percent, and eight percent, respectively. The Build Alternative is also expected to reduce the number of total multiple vehicle crashes along the I-275 and I-4 corridors by 25 percent and nine percent, respectively.